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A
HAND-BOOK
OF THE
MANAGEMENT OF ANIMALS IN CAPTIVITY
IN
LOWER BENGAL,

By RAM BRAMHA SANYAL,
Superintendent of the Zoological Garden, Calcutta.

PUBLISHED UNDER THE AUTHORITY OF THE COMMITTEE FOR THE
MANAGEMENT OF THE ZOOLOGICAL GARDEN, CALCUTTA.



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PREFACE.

NATIONAL ZOOLOGICAL PARK

IN the Resolution of the Government of Bengal on the Report of the Committee for the management of the Zoological Garden, Calcutta, for the year 1888-89, the following passage occurred:—

“As the Zoological Gardens have now been in existence for 13 years (since 1875-76), it is presumable that many events have taken place among the large number of animals, birds, &c., exhibited from time to time which would be of interest to the scientific world and to persons interested in zoology; also, that considerable experience must have been gained in the management of animals, birds, &c., in confinement, and their treatment in sickness, which would be of practical use to the managing bodies of other Zoological Gardens and to individuals who have private collections. Sir Steuart Bayley is strongly of opinion that it is incumbent on all persons who keep animals in captivity to avoid, as far as possible, anything like cruelty (such as want of space, or air, proper food or cleanliness) in their treatment, and he recognizes that the Zoological Gardens' Managing Committee set an excellent example in this respect. He would venture to suggest that from the records of the Committee and the recollections of their able Superintendent, it would be possible for them to produce a hand-book which might be of great use to the numerous nobles and other persons who on a smaller scale keep collections of animals or birds in captivity.”

At a meeting of the Committee on April 2nd, 1890, it was determined that a Sub-Committee be appointed to give effect to the above Resolution.

This hand-book has accordingly been prepared by Babu R. B. Sányál, the Superintendent of the garden, on a plan drawn up by the Sub-Committee. Mr. C. E. Buckland, c.s., has supervised the preparation of the work. Its principal aim has been to collect the experience gained in the Calcutta

Zoological Garden in the management of animals, and to state the facts in the fashion most likely to render them practically useful as a guide to those who may keep private collections of animals. Some notice has been taken of every species of animal ever exhibited in the garden, and in doing this the ordinary scientific classification has been adhered to: at the same time, the use of scientific terms has been to a great extent avoided, and vernacular equivalents have been substituted for them.

AUTHOR'S PREFACE.

SHOULD this book fall into the hands of any European naturalist or manager of a vivarium, I trust that he will consider the fact that it is intended for India, where trained supervision is a desideratum. Besides, its publication may stimulate others more experienced and competent to record and publish the result of their experience; so that, in time, a more accurate and extensive literature on the treatment of animals in captivity may be produced.

As the object of the hand-book has been to take notice, as far as possible, of the treatment adopted or necessary in individual cases, some repetition has been unavoidable.

With regard to the classification, description, and distribution of animals, I have generally followed Anderson, Blanford, Hume, Jerdon, Oates, Selater, Scully, and other naturalists of repute. My obligations are due to Mr. C. E. Buckland, c.s., for the supervision he has given to my efforts, and to Mr. W. L. Selater, Deputy Superintendent, Indian Museum, for having allowed me access to the collection of skins in the possession of the Indian Museum, and for his general advice and assistance.

ZOOLOGICAL GARDENS,

Calcutta, March 1892.

R. B. SÁNYÁL.

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A HAND-BOOK
OF THE
MANAGEMENT OF ANIMALS IN CAPTIVITY
IN
LOWER BENGAL.

N.B.—The names of the “Class,” “Order,” “Family,” “Genus,” &c., having been given in the Table of Contents, are not repeated throughout the work.

(1) THE ORANG-OUTANG.

(SIMIA SATYRUS—Linn.)

Hindi—*Jangal-ka-admi*. Bengali—*Ban-mānus*.

Hab.—Borneo and Sumatra.

LENGTH OF LIFE IN CAPTIVITY.

The greatest length of time during which any orang has as yet survived in the garden has been seven years, but this does not represent an absolute maximum, as the particular specimen which has lived so long is still alive and well.* The duration of life of other animals of the same species, which have from time to time been exhibited in the garden, has varied from three months to nearly three years.

TREATMENT IN HEALTH.

Housing.—The orang-outang is an extremely delicate animal, being susceptible to the slightest change in the weather and to the least dampness in its dwelling. It is therefore necessary that its accommodation should be such as to insure it against both these risks. The dwelling, moreover, should not be made of destructible materials, as, however delicate it may be constitutionally, a healthy orang is a powerful animal, and its propensities for mischief are great.

The following directions will be found useful in providing accommodation for orang-outangs. With a view to protecting these animals from extremes of temperature, a substantial *pucca* structure is required. At the same time, unless the building can be well shaded by trees and of considerable elevation (which would be both unsightly and expensive), its interior will become as hot as an oven during the midday heat of an Indian summer. In the absence, therefore, of shade and elevation, the roof should be overlaid with a covering of *durmah* mats, arranged in such a way as to allow free access of air underneath. It is necessary

* This animal has died, while this work has been under publication.

to be equally careful to keep out the cold and draughts during the long winter nights. A thick bedding of straw is, of course, indispensable.

The building should be well raised from the ground. It ought to be divided into two parts—an inner sleeping-room, where the animal can also retire in case of bad weather, or whenever it likes, and an outer cage.

A brick-built room, 14 feet long, 12 feet broad and 7 feet in height, with sufficient apertures in the wall to allow of ventilation, and a sky-light, will be found to answer admirably as a sleeping-room for a couple of orangs. The outer cage should be of the same dimensions, and closed in on three sides and the top with one inch wrought-iron bars. The floor of the building should be at least 3 feet above the ground level.

As it is impossible, in Lower Bengal, to secure perfect freedom from damp in any one-storied room, it is advisable to place in the sleeping apartment a wooden platform, covering the length and breadth of the room, some eighteen inches above the floor.

An orang-outang's dwelling, like a human habitation, requires suitable furniture to make it complete. Perches, swings, trunks of trees, horizontal bars, have been found to be the best substitutes for this creature's natural surroundings. Wooden balls afford it perpetual amusement, and a common looking-glass of ordinary dimensions, firmly fixed to the wall, is an object of the greatest curiosity and pleasure to this wild man of the woods.

Food.—An adolescent, or a full-grown, orang maintains excellent health when fed upon a mixed diet consisting of three or four plantains, a quarter of a seer of soaked gram, a quarter of a pound loaf of bread, one egg (unboiled), and such fruits or vegetables as may be available according to the season, repeated twice daily. The cost of such a diet for a full-grown orang will be about Rs. 5 per month. But it is as distasteful to an orang as it would be to a human being to live upon the same kind of food without change. The diet should, therefore, be varied from time to time, and different articles substituted according to the taste, appetite, and state of health of the animal, as ascertained by observation. Three different courses of diet are given in the following scheme, which will be found useful as a guide under ordinary circumstances:—

- (1) Plantains, rice (boiled), biscuits, vegetables.
- (2) Gram (soaked), milk, bread, fruits.
- (3) Plantains, egg (raw), sugarcane, &c., fruit or sweet potato.

The fruits include papaya, guava, mango, tepari (*Physalis-peruviana*), rose-apple, orange, bael, &c., and pumpkins, cucumber, cabbage, raddish, peas, beans, sweet potato, brinjal, carrot, &c., may be given as vegetables.

Besides the articles enumerated above, there are many other things which an orang will gladly take as food, such as bael fruit tablets, the leaves of screw pines, husks of the green cocoanut, and the succulent pith of a date-palm. No two orangs, however, have exhibited identically the same taste, so that one may refuse to taste what another has consumed with avidity.

Breeding.—Orangs have never bred in this or (so far as known to the writer) in any other garden.

Transport.—It may be necessary sometimes to transport an orang from one place to another, and for this purpose a good strong cage must be used. For a full-grown orang-outang the cage ought to be at least 5' × 4' × 5', made of well-seasoned planks with iron bars in front. The bars should not be more than an inch and a half apart from each other, as otherwise the animal is apt to thrust its arms through them—a movement which is not only attended with danger to persons standing near, but to the animal itself. There should be a broad shelf inside the cage for the animal to sit upon, and a moveable tray underneath to facilitate cleaning. The tray must be of sufficient depth to admit the feeding and drinking vessels, which should all be removed soon after the animal has fed and drunk. Either a thick canvas screen or a removable shutter should be provided in front, so that in case of bad weather the animal can be perfectly protected from draughts. As a protection against extremes of heat and cold some mats and blankets should be given, the former to protect the cage from the heat of the sun, and the latter for the animal to wrap round itself when cold.

TREATMENT IN SICKNESS.

The diseases to which orangs have been found most subject are *diarrhœa*, *dysentery*, *bronchial catarrh* (severe cold affecting the chest), *inflammation of the lungs*, and *paralysis*.

Diarrhœa and *dysentery* are common in young and newly-acquired specimens, and, if not checked by timely remedies, prove fatal in the majority of instances.

Bael (*Ægle marmelos*) is very efficacious in checking *diarrhœa* and *dysentery* if given at an early stage. There are several forms in which it can be administered :—

- (a) Three to four chittacks of ripe pulp, freed from seeds and glutinous exudations, given twice or thrice daily.
- (b) *Bael sherbet.*—The following recipe can be recommended: Take one part of ripe pulp and eight parts of pure water; crush the pulp so as to mix it thoroughly with water; strain through coarse linen, and sweeten with sugar. Four or five ounces of the sherbet given three times a day, for two or three days, ought to check the *diarrhœa* or *dysentery*. In very obstinate cases 10 to 15 drops of tinct. kino may be added to each dose of sherbet.
- (c) *Bael fruit tablets.*—Preserved bael fruit tablets are sold in the bazar, and can be had for four to six annas a pound. Two or three of these tablets given in the food twice daily should benefit the patient.
- (d) If the ripe bael is not available, the green fruit may be roasted and the softened pulp sweetened with sugar or made into sherbet and given in the same quantities as in (b).

In the worst cases of *dysentery* 20 grains of ipecacuanha concealed in a bit of plantain or some other convenient edible may be given with advantage. But as this medicine generally induces nausea and vomiting, it will be found difficult to repeat the dose a second time.

A table-spoonful of lime-water given twice daily with milk checks simple diarrhœa in younger specimens.

Diet.—An orang suffering from *diarrhœa* or *dysentery* should be kept as much as possible to a milk-and-bread diet. If, however, the milk is found to disagree with the patient, it should be diluted with a little soda-water. Barley, sago, and arrowroot sweetened with sugar may also be given, or green husk of cocoanut and jaman fruit (*eugenia jambolana*), if available.

If the weather is fine, the animal should be allowed to roam about freely, morning and evening; also the straw bedding should be frequently changed. The hair about the seat should now and then be washed with tepid water and rubbed dry, as otherwise it will become clogged and matted, and the animal's health will suffer.

Severe cold, affecting the chest, is a frequent and troublesome complaint. Five drops of ipecacuanha wine in half a tea-spoonful of honey twice a day, liquorice and honey, ammonia liniment rubbed over the chest and throat, and fomentation, are some of the remedies which have been found successful; snuff is also recommended.

Diet.—Milk and bread, eggs, boiled sweet potatoes, raisins, chicken soup.

The animal should be kept indoors and perfectly warm.

Inflammation of the lungs is brought on by sudden chill, and if not early detected and checked ends fatally. If the animal is tame enough, a poultice and ammonia liniment will be very beneficial.

Paralysis.—Two cases of *paralysis* have come under observation. In one the seizure was brought on by sunstroke, and in the other by exposure to cold and damp. In the former case the animal never recovered: in the latter it was removed to a healthier building, and derived much benefit from the change. No medicine was administered internally, but, to relieve the creature's pain, camphor liniment and fomentation were applied at intervals. In about four months it recovered enough to be replaced in its former dwelling, and appeared to have regained the health it formerly enjoyed.

Older specimens are less liable than the younger to the ailments above mentioned; but when taken ill they are more difficult to cure: they exhibit a greater aversion to food and suspicion of medicine.

OBSERVATIONS ON THE HABITS OF AN ORANG-OUTANG.

"Jennie" was the first orang-outang domesticated in the garden in March 1876. She was accommodated in a small covered enclosure and provided with a square deal box stuffed with straw and hay, and a light blanket for bed; a small earthen *ghurra* filled with drinking water and a tin mug were also placed for her, but she was not seen to make much use of the mug for drinking. Though quite young, probably not more than six months of age, she had the wrinkled face of an old man, and looked scared and cold. From the first she evinced no fear of her keeper, but would sit on the ground close to him taking her food, which consisted chiefly of milk, out of a tin basin

in his hand. She would at other times cling tightly to him,—a boy of fifteen or sixteen years,—folding her long slender arms round his neck ; while he was busy elsewhere she would occasionally venture on an exploration, but the slightest movement of a bear or other large animal in the neighbourhood was enough to frighten her, and send her scampering and bewildered to search for her keeper or her dwelling, whichever she could find first.

A special residence was subsequently made for her, in the shape of a house in miniature with brick walls and thatched roof and windows, and a raised platform inside to keep her off the damp ground. A small compound was enclosed in front of the house and laid out like a garden. After a day or two in her new house, Jennie developed a tendency to mischief, and commenced pulling the straw out from inside the thatch, so that it became necessary to substitute a wooden roof. In the rains Jennie required special care ; a slight exposure to wind and rain caused an attack of cold ; she had to be carefully nursed at nights, fed with chicken soup, and have her chest fomented. As she grew older, other things such as bread, boiled sweet potatoes, &c., were added to the milk diet. When hungry she would scream loudly and show temper, rolling on the ground like a spoilt child ; and no amount of attention or coaxing on the part of the keeper could soothe her till food was forthcoming : her hunger satisfied, she would attempt to put bits of bread and other remnants of food into the keeper's mouth instead of her own.

Another orang, a young male, was obtained about this time to share her captivity, but the new animal was never in sound health, and, in spite of every precaution, soon died. To console herself for the loss of her temporary companion, Jennie soon grew attached to a domestic cat. The milk supplied to Jennie attracted the cat, but the cause of the reciprocity of the sentiment was never discovered. It may have been Jennie's instinctive longing for companionship or her fondness for anything hairy. The cat would patiently allow herself to be subjected to any petty torments which it pleased Jennie in her demonstrativeness to inflict upon her. One of her favourite fancies was to climb up the nearest tamarind tree with her feline companion, oftentimes pulling it up by the tail, and the cat showed no resentment for such treatment. With good food and handling Jennie's appearance altogether improved ; her hair became cleaner and brighter ; she lost the scared and chilly look she had at first ; she seemed to adopt pleasant and elegant manners with the visitors to the garden ; she would gladly submit to be brushed and combed by her keeper, and would at times sit cross-legged on the ground with a hand looking-glass in front, making faces at herself. During the winter a flannel suit was given her, but she soon tore it to pieces. In the summer of 1878, the Committee, having received an urgent application from the London Zoological Society for a young orang-outang, sent Jennie to England, accompanied by her favourite cat.

For further information regarding orang-outangs the following books may be consulted:—*Malayan Archipelago*—Wallace ; *Man's Place in Nature*—Huxley ; *Anthropoid Apes*—Hartmann.

(2) THE HOOLOCK GIBBON.

(HYLOBATES HOOLOCK—(*Harlan.*))Hindi—*Ulook Bandar, Kala Bandar.* Bengali—*Ulluk.**Hab.*—Assam, Sylhet, Cachar, Manipur, Irrawadi Valley near Bhamo, Chittagong and Arracan.

LENGTH OF LIFE IN CAPTIVITY.

The longest period during which any hoolock has lived in the garden as yet has been nine years, one of a pair of hoolocks presented in 1883 being still alive. This is, however, the only instance in which a hoolock has lived so long. As a rule, the duration of life, in captivity, of this and other species of the genus is short.

TREATMENT IN HEALTH.

Housing.—Hoolocks are as delicate as oranges; the same care and forethought are, therefore, necessary in housing and feeding them. Much trouble and annoyance, caused by their frequent illness and death, may be saved by giving them a lofty and airy dwelling well raised from the ground, with means and appliances for the admission of sun and light and the exclusion of draughts and cold. The maintenance of an equable temperature is the first desideratum.

Wet, draught, and cold are fatal to hoolocks, at least in captivity. The Gubbay House in the Calcutta Zoological Garden has been found most suitable for the health and comfort of the gibbons as well as other varieties of monkeys and smaller mammalia of delicate nature. It is an oblong brick building, measuring 50 feet long by 30 feet broad by 22 feet high, with an arched Leslie-patent roof. The doors and fan-lights are all made of thick plate glass, so that, while light and air are freely admitted, draughts and cold can be effectually excluded and the temperature regulated. The cages, each measuring 7 feet 6 inches long by 5 feet 6 inches broad by 14 feet high, are fixed in separate blocks against the walls, an arrangement which, although involving unnecessary waste of space, has been allowed to continue, as it does not interfere with the health and comfort of the inmates. The Dumraon House also is well adapted to the requirements of a good monkey-house, and in it also hoolocks are kept. In this building the eight cages, each measuring 12 feet long by 7 feet broad by 19 feet high, are arranged in two rows with a broad passage between. As they are intended to accommodate monkeys of unequal strength and size, the cages on one side have been built of thicker iron rods with wider spaces between them, while those on the other side have been made of lighter and closer rods. To prevent the monkeys in contiguous cages from biting one another, it has been found necessary to have strong wire netting of 1 inch mesh attached to the partitions separating one cage from another. Additional light and ventilation are obtained from a sky-light, with glass shutters, in the roof.

Although generally timid and inoffensive, hoolocks, like other animals, are sometimes intolerant of intrusion; this has been noticed specially when one has lived for some time in a particular cage. Newly obtained specimens should not, therefore, be placed with previous acquisitions. An opportunity should first be given to them to become accustomed to each other's presence through the bars, and this is best done

by keeping the new animal in a box outside the cage of its future companion, and observing their attitude towards each other. The most successful plan for keeping hoolecks alive for any length of time, either in a zoological garden or in a private collection, is to let them run about freely in the open as often and for as long as possible. If, however, a new arrival were to be allowed such liberty, there would be a great risk of losing it: the best course is therefore to allow it to first acquire some tameness, which can usually be done in about a fortnight or a month, and then let it run about. After it has once become habituated to the locality and food, it is sure to come back to the place and at the hour of feeding. A hooleck is thus enabled not only to take plenty of exercise, which its system much requires on account of its arboreal habits, but the freedom gives it a chance of finding its own food, such as the spiders and insects and eggs of small birds, which form no inconsiderable portion of a gibbon's diet in a state of nature.

A cage of the dimensions above given will accommodate two pairs of hoolecks. To relieve the monotony of their captive life, a few playthings should be provided, such as rope-swings, brass bells and wooden balls. A thick bedding of straw on the floor of the cage gives warmth during the winter, and greatly conduces to their amusement at all times.

Food.—An adult hooleck in captivity may be fed on boiled rice, soaked gram, various kinds of fruits and roots, bread, biscuits, eggs, and occasionally sparrows: a live sparrow given at intervals is much relished. A few grasshoppers, say five to eight, should also be given sometimes.

The three following scales of diet will indicate the quantity of food necessary for each hooleck per day and its cost per month:—

(a)	Loaf of bread	... 1 chittack	} twice daily. Cost Re. 1-8 per month.
	Boiled rice with a pinch of salt	... 2 chittacks	
	Egg	... 1 (raw)	
(b)	Biscuit	... 1	} twice daily. Cost Rs. 2 per month.
	Soaked gram with a pinch of salt	... 2 chittacks	
	Plantains	... 2	
	Grasshoppers	... 5 to 8	
(c)	Plantains	... 2	} twice daily. Cost Rs. 2 per month.
	Sweet potatoes	... 2 chittacks	
	Milk	... 2 "	
	Loaf of bread	... 1 chittack	

Instead of plantains and sweet potatoes any other fruit or root may be substituted. Some of the hoolecks have been found to eat leaves with avidity.

Clean drinking-water should always be kept in the cage.

Feeding time— { Morning between 8-30 and 9.
Evening " 3-30 " 4.

Breeding.—Hoolecks have never bred in this garden.

Transport.—In transporting a hooleck the same precautions should be observed as in the case of an orang. The cage, of course, need not be so strong or large.

TREATMENT IN SICKNESS.

The principal diseases to which a hoolock in captivity is subject are *diarrhœa*, *severe cold affecting the chest*, *consumption* and *skin disease*.

Diarrhœa has often been overcome by bael, timely given, and a light and wholesome diet, such as milk and bread, or barley and water. If allowed to run on, it terminates fatally.

Severe cold affecting the chest.—The animal should be kept in a warm place, and, if possible, covered with a blanket.

Ten grains of chlorate of potash in an ounce of simple syrup afford great relief to the patient.

Fomentation applied to the chest and throat, and chicken soup are also recommended.

Consumption generally runs an insidious course and results in death. If the malady is detected early, and the animal tame, it should be allowed to run about during the day and in fine weather. Whether tame or not, it ought to be removed from the monkey-house and kept in a good roomy cage in a well-ventilated place. By way of medicine it should have a tea-spoonful of syrup of hypophosphate of lime, twice or thrice a day, and a tea-spoonful of glycerine with milk twice daily. Nutritious and easily digestible things should be given as food, such as corn-flour boiled with milk, oatmeal-cakes, eggs, raw or boiled, &c.

Skin disease is a very troublesome complaint which sometimes affects these animals. Complete isolation is requisite. The following treatment can be recommended:—

Wash the body with soap and tepid water, and rub it thoroughly with powdered borax and sulphur (one part borax and three parts sulphur). Repeat this treatment three times a week till cured.

OBSERVATIONS ON THE HABITS OF HOOLOCKS.

With very rare exceptions hoolocks are gentle creatures and, when kindly treated, become very tame and even affectionate. They often express their sense of joy and affection for favours bestowed on them in the shape of biscuits, buns and fruits, by extending their long arms through the bars of the cage and gently twining them round the neck of their benefactor. They have a keen sense of jealousy which they have been often observed to manifest by great restlessness and a kind of suppressed moaning, if they do not happen first to receive the attention of the keeper or any one else who may be feeding the other animals living in the same building with them. The idea of fun is also greatly developed in them. Soon after the establishment of the garden a number of monkeys were, for want of better accommodation, kept together in one compartment. It was at this time that the hoolocks were observed to make merry at the expense of other monkeys. Although not possessed of the pluck and strength of the others, the hoolocks showed remarkable cunning and agility in eluding the pursuit of an irritated Hanuman or a vindictive Rhesus.

When the other monkeys were engaged in quarrelling—not an uncommon occurrence when several different kinds of monkeys are kept together—one of the hoolocks would softly let himself down by the help

of the rope-swing or the ladder, pull the tail or gently tap the head of a combatant, and scamper off before the assailed had time to turn and seize his tormentor. Like human beings, the hoolocks have also individual peculiarities. There was at one time an old female hoolock in the garden, which had an inveterate hatred of the gentler sex of the human race, and carried her dislike to a passion. She became fierce and dangerous at the sight of a female visitor, dashing furiously against the bars of the cage, so that special precautions had to be taken to prevent her escaping and doing harm. On one occasion, however, she managed to escape by eluding the vigilance of the keeper as he was about to close the door. Having got loose she at once attacked an ayah who happened to be passing, inflicting a severe wound in the woman's leg with her long canine teeth. A notice was immediately affixed to her cage warning visitors not to approach too near. She used to throw out her long arms and endeavour to drag female visitors towards her, and cases were reported in which inattention on their part to the warning notice cost them a handkerchief, a glove or a bonnet. It has been noticed that the hoolocks from the Assam jungles bear captivity better than those from Chittagong and Arracan. A hoolock has often been observed to drink by scooping up water or milk in its hand.

(3) THE WHITE-CHEEKED GIBBON.

(HYLOBATES LEUCOGENYS—*Ogilby.*)

Description.—About the size of a hoolock. Colour entirely black, with the exception of the surface below the ears, the cheeks, and a small part immediately behind the chin, which are white. In some specimens the white parts are scarcely visible.

Hab.—Siam.

(4) THE WHITE-HANDED GIBBON.

(HYLOBATES LAR—(*Linn.*))

Description.—The chief characteristics of this species are its whitish hands and feet, white or grey whiskers and beard, and a narrow band of the same colour above the eyes; the rest of the body is black.

Hab.—Arracan, Lower Pegu, Tenasserim and the Malayan peninsula.

(5) THE AGILE GIBBON.

(HYLOBATES AGILIS—*F. Cuvier.*)

Description.—The characteristic features of this monkey are that the back part of its head, the flanks, the hips and the outer surface of the limbs are pale yellow or yellowish grey. The chest, stomach, and inside of the limbs and feet are dark brown.

Hab.—Sumatra.

(6) THE LONG-ARMED APE.

(HYLOBATES LEUCISCUS—(*Schreb.*))

Description.—Colour uniform grey; face much paler than other parts; fingers and toes black, at least much darker than other parts; hair dense and woolly.

Hab.—Java.

(7) THE SIAMANG.

(HYLOBATES SYNDACTYLUS—(*Desm.*))

Description.—Larger and more robust than all other gibbons. General colour deep black. The chief features of this gibbon are its large dilatable *sac* in the throat and the webbed middle and index toes of its foot.

Hab.—Sumatra.

The following remarks apply to all these species (3 to 7).

LENGTH OF LIFE IN CAPTIVITY.

A white-cheeked gibbon obtained early in 1889 is still alive and well. The others have lived in the garden for periods varying from a few days to a few months. Most of them are delicate animals and do not bear captivity well.

TREATMENT IN HEALTH.

Housing.—With regard to housing, feeding and transport, these animals may be treated like a hoolock. In feeding, allowance should, of course, be made for individual tastes. A white-cheeked gibbon has been found, although fond of grasshoppers, not to care for eggs, either raw or boiled.

Breeding.—Nothing is known about their breeding in captivity.

TREATMENT IN SICKNESS.

Only a limited number of specimens of each of the species mentioned above have come under observation, and as most of them died without having developed any marked symptoms of illness, no experience has been gained in the treatment of their diseases. But as their habits and food are nearly similar to those of the hoolock, it is highly probable that they are subject to the same maladies also. A white-cheeked gibbon, for instance, lately suffered from an attack of skin disease. It was noticed that it would not make friends with another inmate of the same cage, a hoolock. It became weak and emaciated, and skin disease supervened. The hoolock was removed, and a wholesome diet, which soon cured the animal, was prescribed as follows:—Bread and milk, 2 chittacks of each, and two or three plantains and some raisins in the morning at about 8-30. Two chittacks of gram, soaked in water, a pinch of salt, occasionally a small quantity of rice, one biscuit, either one or two plantains or papaya, or some other fruit in the evening; a few grasshoppers every day, and a lump of sulphur in the drinking water.

OBSERVATIONS ON THEIR HABITS. .

The white-cheeked gibbon is very light and active. At times it will move incessantly from side to side of the cage, or from one perch to another, or tumble on its straw bed and roll head over heels and again bound away to the top of its prison. Like the hoolock, it drinks water by scooping it up with its knuckles or fingers and licking it, or by simply applying the lips to the drinking vessel. Its call is quite distinct from that of a hoolock. In winter it is more noisy in the middle of the day than either in the morning or evening; excessive heat has the effect of moderating its spirits. When the weather is dull or cold it sits huddled up, either on the floor of the cage or on the ledge of the wall, looking the very picture of misery and depression; with the return of warm weather it becomes active and playful. Like the orang and the hoolock, it goes to bed early. It can walk a few steps as well as, or better than, a hoolock—that is, without much waddling. The habit of thrusting out its long slender arms in demonstration of its sociable and affectionate nature has not been much noticed in this species.

Of the habits in captivity of the other gibbons mentioned above very little is known. Most of them are as active and light as a hoolock or a white-cheeked gibbon; the siamang that lived in the garden appeared to be dull and morose.

For further particulars on the distribution and habits of gibbons, the following books may be consulted:—Anatomical and Zoological Researches—Anderson; Malay Archipelago—Wallace; Anthropoid Apes—Hartmann.

(8) THE HANUMAN.

(SEMNOPITHECUS ENTELLUS—(*Dufresne.*))

Hindi—*Langur*, *Mahābir*. Bengali—*Hanuman*, *Hanu*.

Description.—The hanuman is a well-known monkey in Lower Bengal: it is slender and elongated in form; the head and body are about 2 feet long and the tail is slightly over 3 feet; there is no crest on the crown of the head; hair of the eyebrows stiff and projecting; colour of the head, body, limbs and tail varies from greyish brown to pale isabelline throughout; hands and feet black; face, ears and soles of hand and feet also black.

Hab.—South-Western Bengal, Orissa, the Central Provinces, Bombay, Guzerat, Southern Rajputana and part of the North-Western Provinces, extending to Kattywar, and probably Cutch. They are not indigenous east of the river Hooghly, although stragglers are often found.

LENGTH OF LIFE IN CAPTIVITY.

The maximum period during which a hanuman has lived in this garden has been six years. Although indigenous to the country, and living in a wild state within ten or twelve miles of Calcutta, these animals do not bear captivity well.

TREATMENT IN HEALTH.

Housing.—In keeping these animals it is necessary to bear in mind that hanumans are essentially gregarious animals, and that unless a large number of them are kept together they pine away and die. But to crowd twenty or thirty of them into a comparatively small cage would be equally wrong. Apart from any question of cruelty, it is detrimental to their health to deprive them altogether of the opportunity of indulging the habit of bounding and leaping which they possess in an astonishing degree in a state of freedom. To afford the necessary facilities, a large house is required, of the size and plan of the Gubbay or Dumraon House (see page 6), devoted entirely to the hanumans. In a house 50 feet long by 30 feet broad and of proportionate height, with means for isolating the refractory and the weak, 30 to 40 hanumans could with comfort be kept. As they, especially the older males, are strong and powerful animals, and are wont to jump against the bars of the cage and shake them with considerable violence, these need to be very firm. Stout branches of trees should be let into the floor and the usual perches and swings provided. It has not been possible in this garden to assign an entire house, as suggested above, to these monkeys. A small number of them have been lodged in one or other of the cages of the Gubbay or Dumraon House. The tradition that male and female hanumans live in separate troops throughout the greater part of the year is apparently incorrect; it is nevertheless necessary that there should be a preponderance of females to males, so that in a collection of 30 hanumans there would be no need for more than half a dozen males. In selecting hanumans to replenish stock preference should be given to young and adolescent animals, as they are likely to do better than the older ones, which are generally ill-tempered.

Animals of uncertain and vicious temper, especially monkeys, which have become savage from various causes, as family pets, are often sent to this garden as a comfortable and convenient home. Such creatures, whether hanumans or other monkeys, should never be placed with those already in captivity: if this is done, there will be no end of fighting and biting. These should either be kept in spare cages of one of the monkey-houses, when available, or in one of the movable cages, and if practicable in sight of the tamer specimens.

Food.—With the exception of eggs, grasshoppers or any other kind of animal food, the same diet that has been indicated as suitable for an orang or a hoolook will do for a hanuman, provided a sufficient quantity of leaves is given every day. Almost all the members of this genus consume leaves largely in a wild state, and unless this essential element of their natural diet is regularly supplied them in captivity, no amount of good feeding is of any avail. They strip off the pinnate leaves of the sajina (*Murenga pterigosperma*) with great dexterity. The following are some of the trees and creepers the leaves of which experience has shown to be best suited to, and most liked by, these animals:—sajina (*Murenga pterigosperma*), pipul (*Ficus religiosa*), bair (*Ziziphus jujuba*), amra (*Spondias mangifera*), tamarind (*Tamarindus indica*), telakucha (*Momordica monadelpha*), bael (*Ægle marmelos*).

Breeding.—Hanumans have not unfrequently bred in this garden, and have never produced more than one at a birth. It is always better to isolate the female before the birth takes place, so that it may be better observed and precautions taken to guard against the *constipation* and *indigestion* to which an animal in this condition is not unfrequently subject.

In cases of *constipation*, half an ounce of raisins or prunes, or one or two boiled onions should be given. No food should be allowed so long as the indigestion lasts. Damp, cold and draughts should carefully be avoided. The female with offspring should not be replaced among its companions until the young one is three or four months old. Should anything prevent the isolation of the female before giving birth, or should the birth take place unexpectedly, the proper measure is to remove all the ill-tempered creatures, if there are any in the same cage, to another place. This is easily accomplished by decoying them with food. A female monkey and her offspring have on more than one occasion thriven without isolation, but separation is advisable with a view to more careful observation and to guard against any possibility of molestation from the other and less friendly inmates of the same cage, especially at the time of feeding. It may be supposed, too, that all animals naturally prefer seclusion at such times.

Transport.—No very elaborate preparations are necessary to transport a hanuman, either by rail or by ship. The same kind of cage as has been recommended for an orang, but lighter,* will comfortably accommodate four of these animals—three females and one male. If the journey is by rail, and to last for a few days only, some of their favorite leaves in addition to the ordinary food can easily be provided. If a long sea voyage has to be undertaken, no leaves can be sent with the animals.

In cold latitudes and in rough weather the cage containing these monkeys on board a steamer ought to be placed near the engine-room, as severe cold kills them. They must always have drinking water in their cage, otherwise they drink to excess when opportunity offers.

TREATMENT IN SICKNESS.

Diarrhœa and consumption are the principal diseases from which these monkeys have been observed to suffer in captivity.

Diarrhœa in a hanuman is treated in the same way as in a hoolock. Leaves should either be stopped, or judiciously given during the time the malady lasts.

Consumption.—Several cases of this disease have occurred, but in none of them was it detected until after the death of the animal.

Wounds and injuries, the results of fighting and accidents, are also of not unfrequent occurrence.

OBSERVATIONS ON THE HABITS OF HANUMANS.

The hanuman in captivity has none of the sprightliness and friendliness of a hoolock or the amusing characteristics of an orang. The older animals are generally dull and languid, and the males even savage and spiteful. Instances are known of their attacking and

* In this case no iron rods are necessary, so that wooden battens may be advantageously substituted.

wounding an incautious keeper without provocation. When annoyed or provoked, both the young and the old have a peculiar way of expressing their feelings by a kind of grin and a harsh, grating note, accompanied by such action as may either indicate a readiness of the animal to bound away, or to attack the object of its wrath on the slightest further irritation. A tame hanuman sometimes becomes extremely attached to its guardian. There is also evidence to show that it appreciates kind treatment. A large male hanuman once hurt its elbow; the wound festered, so that an operation became necessary. The animal was removed to a small handy cage, and the wound, after having been opened, was carefully dressed and bandaged. This latter operation had to be repeated for about a fortnight, and the animal would extend its arm to be dressed, and show not the least fear or displeasure at the pain unavoidably caused by syringing the tender sore. Female hanumans have a great affection for their young. It has been observed more than once that, when the young ones die while still being nursed, the mothers refuse to allow them to be removed. Besides the harsh, grating whine expressive of anger or fear, the hanumans have two other notes; the deep, loud whooping call which is seldom heard in captivity, and the plaintive suppressed screaming of young animals. They generally sit with their feet resting against the bars of the cage.

For further information regarding hanumans, Blanford's Fauna of British India—Mammalia, may be consulted.

(9) THE CRESTED MONKEY.

(SEMNOPIITHECUS CRISTATUS—(*Raffles.*))

Description.—Head and body about 2 feet; tail about 2 feet 6 inches; slender in size; colour generally dark grey; hair in general black, tipped with white; face, forearms, hands and feet black; under parts of the body paler; head crested.

Hab.—Sumatra and Borneo.

(10) PHAYRE'S LEAF-MONKEY.

(SEMNOPIITHECUS PHAYREI—(*Blyth.*))

Description.—An adult male measures, head and body, about 22 inches; tail 30 inches; slender in form. The chief characteristics of this monkey are its peaked longitudinal crest on the head; somewhat long whiskers, nearly covering the ears; eyelids and a broad surface above them white or whitish; white hair around the mouth; back parts dark ashy brown or grey; chest and abdomen whitish. It presents a peculiar spectacled appearance owing to the white colour of the eyelids and the surface above them.

Hab.—Arracan, the Bassein districts of Pegu, Northern Tenasserim.

LENGTH OF LIFE IN CAPTIVITY.

An example of each of the above species (9 and 10) has been living in the garden for the last ten years.

TREATMENT IN HEALTH.

Housing.—These animals have lived in excellent health in one of the cages of the Gubbay House.

In the ordinary course of management it may sometimes become important to remove the inmates of one cage to another in the same or in a different house. The essential point to remember is that it is necessary to be careful, as the least interference with their accustomed mode of life makes them suspicious, defeating, it may be, the very object of a change. On one occasion, though the gentlest means were adopted, the simple operation of a transfer frightened one of these animals so much that it touched neither food nor water for the whole day. Although these monkeys are by no means hardy animals, the excellent health which those in the garden have enjoyed so long is mainly due to the suitability of their dwelling-house, where they can be protected against all the risks of a changeable climate.

Food.—Soaked gram, boiled rice, plantains, bread, biscuits, pumpkins, sweet potatoes, dates, have been found to agree best with them. They do not appear to have the same partiality for leaves as hanumans have. Doob grass and tender shoots of the tamarind and pandanus leaves are, however, sometimes acceptable to them; the same quantity of food as has been recommended for a full-grown hoolock is enough for one of these monkeys.

Breeding.—These animals have never bred in this garden.

Transport.—They can be transported in the same manner and with the same precautions as a hanuman.

TREATMENT IN SICKNESS.

These animals have uniformly maintained excellent health. With the exception of a single occasion when the Phayre's monkey suffered from an attack of *diarrhœa*, they have never been known to be unwell.

OBSERVATIONS ON THEIR HABITS.

Both the Phayre's and the crested monkeys are very shy. They generally avoid coming down from a retired place close to the top of the cage. Though very quiet, they are not uninteresting. There is a certain playfulness in their habits, but not so strongly developed as in the case of other species. They are to a certain extent inquisitive, but not at all mischievous. They agree very well with one another.

The following species (11 to 16) may be mentioned together.

(11) THE ASSAM LANGUR.

(SEMNOPITHECUS PILEATUS—*Blyth.*)

Description.—Smaller than a hanuman. Hair of the crown thick, forming a kind of cap, which is distinct in some individuals, but indistinct in others: hair of the cheeks long, directed downwards and backwards, partially covering the ears and forming a short ruff. Eyebrows long and stiff. Tail long and tufted. The upper surface of the head and the back part of the body ashy grey: the limbs are ferruginous grey, the hands and feet dark brown, and the fingers pale yellow. Throat, chest and the front part of the body generally yellowish white

or pale orange, sometimes ashy white. Face black; extremity of the tail black.

Hab.—Assam, Sylhet, Tipperah, Chittagong, Arracan and Upper Burmah.

(12) THE PROBOSCIS MONKEY.

(SEMNOPIITHECUS (NASALIS) LARVATUS—*Geoff. St. Hilaire.*)

Description.—The chief feature of this monkey is its nose, which is produced into a proboscis. The animal is thus described by Dr. Anderson (Anatomical and Zoological Researches, 1878):—"The upper surface of the head, neck, back and flanks dark red-brown, passing into greyish yellow on the crupper, tail, and limbs. A yellow stripe on the shoulder. The hair of the sides of the face, neck and shoulder is long and of a yellowish tint variegated with reddish brown, and the chin is well bearded. The under parts are yellowish white and the tail is tufted. The face is dirty yellow merging with white around the lips. The under surface of the extremities are blackish, and the ears are of the same colour, and small. Nose produced into a proboscis with large nostrils opening downwards and separated from each other by a septum (partition) * * *. The eyes are rather widely apart, the neck short, and the throat rather swollen from the presence of a laryngeal sac."

Hab.—Borneo.

(13) THE RED-HAIRED MONKEY.

(SEMNOPIITHECUS RUBICUNDUS—*Müller.*)

Description.—About the same size as an Assam langur. The characteristic features of this monkey are its dark maroon colour, and the radiating hair of the forehead. In some specimens the hands and feet are blackish; in others, of the same colour as the body. Hair of the sides of the body long and directed downwards and backwards. Face and lips flesh-coloured, blotched with pale bluish black spots.

Hab.—Borneo.

(14) THE BANDED LEAF MONKEY.

(SEMNOPIITHECUS FEMORALIS—*Horsfield.*)

Description.—Dr. Anderson describes it as "a uniformly brownish black monkey, the limbs, head and tail being almost wholly black, but the difference between the colours is not well defined, and the fore limb is grizzled with whitish hairs. The tail is slightly tufted at its extremity. There is a rather short, vertical crest directed backwards, the hair anterior to it projecting forward over the eyebrow. The ears are moderately large and partially exposed. The hair on the front and side of the head and on the middle of the crest is blackish or dull brown. The upper lip and chin are clad with short whitish hairs, with longer black hairs intermixed on the chin. Along the flanks the hair is short, sparse, brown, and somewhat grizzled, which is the character

also of the belly. The throat, sides of the neck and chest are concolorous with the upper parts. A narrow, well-defined white line passes along the middle of the under surface from the chest in the adult to the hinder portion of the abdomen, * * * the white line is prolonged as a fine line to the wrist and ankle."

Hab.—Borneo, Sumatra and the Malayan peninsula.

(15) THE PURPLE-FACED MONKEY.

(SEMNOPITHECUS CEPHALOPTERUS—*Zimm.*)

Description.—About the same size as a hoolock, tail about 24 inches. The distinctive characteristics of this monkey are the following:—"A ruff of white hair, more or less tinged with brown, encircling the face and extending on to the throat and under surface of neck; the hair on the sides of the face long, soft, and pointed upwards, forming a conspicuous whisker; the skin of the face black with a purplish tinge; the palms and soles dull black." The general colour of this monkey is greyish black. Tail tufted.

Hab.—Ceylon.

(16) THE SIMPAI.

(SEMNOPITHECUS MELALOPHUS—*F. Cuvier.*)

Description.—It has a slender body about 18 inches in length, tail about 30 inches. The hair of the crown formed into a crest, which is erect and compressed laterally, but not equally distinct in all specimens. Its colour is pale yellowish white; hands and feet yellowish; face bluish black, washed with a leaden hue.

Hab.—Sumatra.

LENGTH OF LIFE IN CAPTIVITY.

Of these, the Assam langur has lived the longest, one obtained in 1883 being still alive. A proboscis monkey lived for about two years and six months, and a red monkey for about the same period. A banded leaf monkey lived for nearly fourteen months; the duration of life of both the purple-faced monkey and the simpai was very short, not exceeding six months in each case.

TREATMENT IN HEALTH.

Housing.—The housing of the Assam langur calls for no particular remarks, except that it does not seem to pine like the hanuman when kept singly; it is, however, better to give it company whenever possible. The comparatively long period during which a specimen has lived in good health in the garden is mainly due, no doubt, to its habitation. The proboscis and the red monkeys, specially the former, are more retiring in disposition, and it is therefore necessary that they should be afforded facilities for privacy. This is very easily done. About two feet below the top of the cage a shelf should be placed, broad enough for a couple of monkeys to sit or lie upon. By boarding

up the sides of the cage from the level of this shelf to the top some seclusion can be obtained. Also, instead of fixing the planks permanently against the wire or the bars of the cage, they may be joined together by battens so as to form a continuous screen for each side of the cage and suspended by books. Such an arrangement has this advantage, that the screen can be removed whenever desired either for the purpose of thorough cleaning or for ventilation.

A screen such as has been described also affords additional protection against bad weather and during very cold nights. The purple-faced monkey and the simpai will do better if they can be allowed occasional liberty in the same way and under the same restrictions as hoolocks on many occasions have been.

Food.—The Assam langur or black-capped monkey appears to be less fond of leaves than most of the other members of the same genus. Possibly their favourite leaves have not been discovered and provided, and those given as food are not appreciated. Several of these langurs have exhibited a slight partiality for a kind of *Amaranthus* leaves; others again would not touch them. The proboscis and red monkeys have shown a liking for the green stocks of paddy and wheat and young shoots of *kalmi* (*Convolvulus reptans*). Neither the purple-faced nor the banded leaf monkey ever thrive in this garden, although the various kinds of food suggested by experience were tried.

Besides leaves and grass these monkeys must have fruits, vegetables, bread, biscuits; in fact all the several articles of food which have been recommended for feeding hanumans and other monkeys will be found useful for these also.

Breeding.—None of these monkeys have ever bred in the garden.

Treatment in sickness.—The only disease to which these creatures are known to be subject is *diarrhœa*; it yields to the same treatment as has been already recommended.

The red monkey occasionally suffered from a kind of *fit*, but the character of the attack was never properly ascertained.

OBSERVATIONS ON THEIR HABITS.

The Assam or black-capped langur is gentle and timid. Even after several years of captivity it has never been known to become sociable. On the other hand, it is never so savage or ill-tempered as a hanuman. In captivity most of them lose the pale yellow colour of the lower parts and sides of the head, neck and chest; whether this is the effect of age or change of conditions has not been determined. In some the colour disappears for a season only, generally during the rains, appearing again in the spring. In its movements the black-capped monkey is more light and active than a hanuman. A specimen in the garden developed, at one time, a mischievous propensity of biting the battens and posts of the wooden cage in which it was for some time kept. Monkeys of this species have not been seen to carry their tails curved forward over their back as a hanuman sometimes does while walking on the floor of the cage, or on the perch. Whatever may be the habits of the proboscis monkey in a wild state, it is silent, slow and phlegmatic in captivity, and sits for hours

together in one place, scarcely noticing the visitors standing outside the cage. The only time that it has ever been seen to become lively is at the hour of feeding, when, shaking off its usual lethargy, it addresses itself eagerly to the contents of the feeding vessel. Once, on the arrival of a young female of this species, it was, after a day or two, placed with the older male then living in the garden. The young one was not found to be at all afraid of the adult monkey, neither did the latter show any hostility towards her, so that during the course of the day they became fast friends. The red monkey is more quick in its movements, and is decidedly more sociable in temperament than the proboscis monkey. The purple-faced monkey is an active, harmless creature, but extremely shy. The few specimens obtained for the garden have all died within a few months after their arrival, so that there has been a want of adequate opportunity of observing them.

For further information regarding these monkeys, the following works may be consulted :—Anatomical and Zoological Researches—Anderson ; Natural History of Quadrumana—Martin.

(17) THE DIANA MONKEY.

(CERCOPITHECUS DIANA—(Linn.))

Description.—Length of the head and body of a full-grown Diana is about 22 inches, tail 27 inches ; slender in build. The leading features of this beautiful monkey are its semi-lunar white frontal band, white beard (which is peaked), white throat, chest, and anterior parts of the shoulders. The abdomen, sides and the inner side of the thighs pale orange red ; a line of white runs along the outer side of each thigh to the knee ; lower back deep chestnut ; the rest of the body dark freckled grey.

Hab.—West Africa.

(18) THE MALBROUCK MONKEY.

(CERCOPITHECUS CYNOSURUS—Scop.)

Description.—Length of the head and body about 18 inches, tail about 20 inches. General colour of the body above greenish brown, washed with olive, under parts whitish ; limbs greyish ; face pale flesh colour ; scrotum blue.

Hab.—West Africa.

(19) THE GREEN MONKEY.

(CERCOPITHECUS CALLITRICUS—Is. Geoffr.)

Description.—Of a uniform light green colour, much paler underneath ; young animals dirty pale green ; length of the head and body about 18 inches.

Hab.—West Africa.

This animal has been recently acquired.

(20) THE TALAPOIN MONKEY.

(CERCOPITHECUS TALAPOIN—(Erxl.))

Description.—Length of the head and body about 14 inches, tail 18 inches. General colour of the body olive green, paler or whitish below; short, straw-coloured whiskers partially hide the ears; face black. There is a faint whitish frontal band.

Hab.—West Africa.

(21) THE HOCHUR MONKEY.

(CERCOPITHECUS NICTITANS—(Linn.))

Description.—Length of the head and body about 16 inches, that of the tail 30 inches. General colour black, freckled with white; limbs black. The characteristic feature of this species is the conspicuous white mark on the lower part of the nose.

Hab.—West Africa.

(22) THE PLUTO MONKEY.

(CERCOPITHECUS PLUTO—Gray.)

Description.—Black throughout. The chief characteristics of this monkey are its well-developed black and white-ringed whiskers, and the broad white frontal band. The hair of the lower back is parted in the middle, and brushed downwards and forwards, washed with greenish white with a chestnut tinge in some places. Tail long, its basal half greenish white, distal half black or greyish black.

Hab.—Angola.

(23) THE LESSER WHITE-NOSED MONKEY.

(CERCOPITHECUS PETAURISTA—(Schreb.))

Description.—Length of the head and body 17 to 18 inches, tail about 22 inches. In the Hocheur Monkey, No. 21, the white is confined to the lower portion of the nose alone; in the present one both the lower half of the nose and the upper lip are white. The whiskers, beard, throat, chest and abdomen are also white. The general colour of the back and head is reddish olive brown; a black band runs across the forehead. The tail is grey above, whitish below.

Hab.—West Africa.

(24) THE MOUSTACHE MONKEY.

(CERCOPITHECUS CEPHUS—(Linn.))

Description.—Head and body about 1 foot 7 inches, tail 2 feet 2 inches. Colour of the body above golden brown, freckled with black; head and thighs tinged with green; tail brownish orange; under parts whitish; whiskers well developed and of a yellowish colour; face violet blue. Upper lip, a white triangular mark above a black margin.

Hab.—West Africa.

(25) THE PATAS MONKEY.

(CERCOPITHECUS PATAS—(*Schreb.*))

Description.—Head and body about 1 foot 5 inches, tail almost twice that length. General colour brownish red ; under parts whitish ; there is a black superciliary stripe, whence a black line runs down to the nose.

Hab.—Senegal, Ethiopia.

(26) THE MONA MONKEY.

(CERCOPITHECUS MONA—(*Schreb.*))

Description.—Colour of the hair brilliant golden green ; back and sides brown or chestnut brown ; outer parts of the limbs and tail slaty grey ; the neck, chest and abdomen white ; a black band across the forehead. Ears and hands flesh coloured.

Hab.—West Africa.

LENGTH OF LIFE IN CAPTIVITY.

A Diana monkey has lived the longest, *i.e.*, from 1876. Although in excellent health otherwise, it has been subject to a paralytic affection of both the hind limbs since 1880, and to which curvature of the spine has latterly supervened. A Malbrouck monkey and a Hocheur monkey have each lived as many as seven years. A Talapoin monkey has been living for the last eight years and is in excellent health. A Pluto monkey has been kept for six years. The moustache monkey lived for eighteen months only. The lesser white-nosed and the Mona monkeys, obtained respectively in 1888 and 1889, are still alive and well.

TREATMENT IN HEALTH.

Housing.—As all these animals are natives of a warm dry climate, they require to be guarded against the risks of the damp and moisture of Lower Bengal. Ample space should also be provided for their gambols and restless activity. In the Gubbay House (described on page 6) nearly all the conditions necessary for their health and comfort are fulfilled.

Food.—All these monkeys thrive on the same food as is given to the hoolocks, hanumans and other monkeys mentioned before. They appear to have no taste for leaves, but are extremely fond of fruits, especially dates and oranges. During the winter, when these fruits are plentiful, they form a considerable proportion of the diet of these monkeys. Boiled rice does not appear to agree with some of them.

Breeding.—The Malbrouck has bred in the garden, the period of gestation being close upon seven months. Before and on the birth of the young monkey attempts were made to separate the male ; these failed, but it proved to be a kind parent. For nearly a month and a half the infant monkey clung to the breast of the mother, to whom an extra allowance of four ounces of milk and two ounces of bread was given for nearly three months from the date of the birth.

Transport.—The suggestions for the transport of hoolocks and hanumans will be found useful for these monkeys also.

TREATMENT IN SICKNESS.

The diseases to which these monkeys have been observed to be most subject are *tuberculosis* of the liver, a kind of *flatulent colic*, *paralysis*, &c. *Diarrhœa* has not been found to be a common complaint among them.

The cases of tuberculosis of the liver were not detected till after the death of the victims, and were therefore not specifically treated.

Flatulent colic.—This disease is evidently attended with pain, but only the younger monkeys seem to be liable to it. It may be caused by careless feeding on the part of the keeper, or by improper and indigestible food given by the visitors. A teaspoonful of castor oil with an equal quantity of honey will soon prove an effective remedy. As the disease generally affects young animals, fomentation can be applied without difficulty, and will be found to give much relief. No food should be given until some time after the medicine has taken effect and the animal shows restlessness and a great desire to eat.

Paralysis.—The Diana monkey was struck by paralysis in consequence of a sudden exposure to chill. Through want of proper accommodation it was kept in a place which, though perfectly free from damp, was not properly guarded against draughts and cold; the space, moreover, allotted to the creature was much too small for its active habits.

As soon as the disease was noticed the animal was removed to a protected place and provided with a blanket. Liniment of belladonna was applied to the affected parts morning and evening. Although no treatment has succeeded in removing the stiffness of its lower limbs, it is otherwise in perfect health.

OBSERVATIONS ON THEIR HABITS.

Agility and activity are the chief characteristics of the monkeys of this group. Most of them are also extremely inquisitive. They exhibit their curiosity, for instance, by searching corners and pockets and constantly returning to the search. They are full of tricks, and will amuse themselves by leaping and tumbling over a walking stick held out horizontally to them. The Diana and the white-nosed monkeys are specially sociable, and like to be caressed and stroked; they will sit with their backs against the bars of a cage and invite friendly visitors to pay attention to them. Nevertheless they are not so affectionate as a hoolock or a young orang, and do not manifest the same clinging attachment to their keepers. For several months after the Diana monkey had become subject to paralysis, it was noticed to become somewhat cross towards the evening; probably it felt worse at that time.

For further information regarding these monkeys Martin's Natural History of Quadrumana or Cassel's Popular Natural History may be read.

(27) THE RHESUS MONKEY.

(MACACUS RHESUS—(*Audebert.*))Hindi—*Bundur*. Bengali—*Bandar, Markat Bandar*.

The common bandars are well known animals in Lower Bengal. They appear to vary much in colour, size, and in the length and thickness of the fur, and even of the tail; some are more decidedly thick-set in build than others; much difference may also be noticed in their physiognomy; the red colour of the face and callosities so characteristic of the adult monkeys is partially or altogether wanting in many.

Hab.—Northern India generally, ascending the Himalayas to about 700 feet and extending as far south as the Godaveri; Assam, Arracan, Western China. Specimens have been obtained from the Simla and Naga Hills, China, and India generally.

(28) THE MACAQUE MONKEY.

(MACACUS CYNOMOLGUS—(*Linn.*))

Description.—It resembles the Rhesus monkey in general appearance, but its tail is longer, being about 19 inches. The colour of the body is grey or greyish brown; face generally dusky; the eyelids white; in some specimens there is a white mark between the eyebrows; it stands as high as a Rhesus.

Hab.—Irrawadi Valley, Burmah, Malayan peninsula, Siam.

These two species (27 and 28) are mentioned together, as they closely resemble each other in structure and habits.

LENGTH OF LIFE IN CAPTIVITY.

The longest period during which a Rhesus monkey has lived in the garden is fifteen years. One obtained in 1877 is still alive, and in excellent health.

A Macaque monkey has lived twelve years.

TREATMENT IN HEALTH.

Housing.—The Rhesus and the Macaque monkeys are not very delicate animals, and with ordinary care thrive well in captivity. They do as well singly or in pairs as when large numbers of them are kept together. In the latter case they give trouble, as they are extremely quarrelsome creatures, and, unless well watched and controlled, fight constantly, and to such an extent that death frequently results from injuries received in fighting. Both the Rhesus and the long-tailed monkeys are domiciled in the Dumraon House (see page 6), care being taken to keep the weak or unhealthy in other places. In this climate it is necessary to avoid overcrowding, so that in a place of the size of the Dumraon House, which is 50 feet long and 23 feet broad, there ought not to be more than 20 or 25 monkeys.

Food.—These monkeys are almost omnivorous. Boiled rice, soaked gram, biscuits, pumpkin, cucumber, brinjal and other vegetables constitute their ordinary food. Eggs are occasionally added to their diet as substitutes for the insects and spiders which, in their wild state, they eat besides fruits and vegetables. The cost of feeding an adult monkey is from Rs. 2 to Rs. 2-8 a month. Minced meat is sometimes, but rarely, given them.

Breeding.—The Rhesus and the long-tailed Macaque have bred and interbred in this garden. The period of gestation is between six and seven months. Female monkeys nurse their young with great tenderness, and are competent to protect them from harm; the older animals do not molest the young, so that the latter have been reared in the midst of a number, but it is always better, as elsewhere remarked, to segregate the female when a birth is expected. A shy and nervous animal while nursing its young is often averse to coming down for food from its retreat, and unless the keeper is intelligent and watchful she has to depend upon the stray bits left uneaten by others and runs the danger of slow starvation. An aggressive creature in a similar condition, on the other hand, provokes quarrels, and is liable to suffer accordingly. On one occasion a Rhesus with a young one was so severely injured in the throat, in foraging for food, that it was with some difficulty removed and cured.

The young monkey after birth attaches itself to its mother, and will not leave her for nearly a month, the mother nursing the young all the time with the utmost solicitude; after this time it will make little excursions on its own account, but is careful not to stray far, and at the slightest sound or movement it seeks refuge with her. The mother is unremitting in her vigilance over her offspring and in her attention to its personal wants and appearance. Compared with an orang-outang of the same age, a monkey is more helpful and intelligent, and in fact all its instincts are strongly developed at a comparatively early age. In about a month the young one begins to pick up gram and other food, and then the struggle for life soon begins, and the mother and the young one commence to fight over their food, although their natural instincts bind them to each other at other times.

Transport.—A travelling cage 5 feet 6 inches long, 3 feet broad, and about 2 feet 6 inches high, will comfortably accommodate 10 to 15 young monkeys for transmission either by rail or by ship. The cage should be made of deal or jarul (*Lagorstræmia regina*) planks, teak being needlessly expensive. Upright battens placed at an interval of an inch and a half should form the front and the upper one-third of the back and sides, the lower two-thirds being made of planks. There must be a shelf for the animals to sit or lie upon, fixed in such a way as to allow of its being drawn out for cleaning; a tray at the bottom is also required. The vessel containing the drinking water should be placed above the level of the shelf, and in such a manner that its contents may not become dirty. As a precaution against cold or bad weather, a good canvas screen for the front and plank shutters for the battened portion of the back and sides should be provided. An iron scraper, some sawdust, a few bundles of straw, and the necessary food, would complete the equipment. A more common kind of cage, but of the same style, is

sufficient, if only two or three monkeys are being conveyed. The older the monkeys are, the more difficult it is to transport a number of them together.

TREATMENT IN SICKNESS.

These monkeys are subject to the same diseases as oranges and hoolocks in captivity. Besides *diarrhœa*, *dysentery* and other diseases already mentioned, they often suffer from various kinds of *wounds*, the results of fighting and accident. Fortunately they possess great vitality, and the process of healing is so rapid that unless the wound is very severe or extensive, little or no human skill is necessary to effect a cure. When the injury is deep or extensive, the following treatment should be adopted. The surrounding fur having been carefully shaved and the wound washed with a weak solution of corrosive sublimate (1 in 1,000 or 1 in 1,500), iodoform should be sprinkled over it. Lint should not be used, even if the wound be somewhat deep, as in that case the monkey will finger it constantly until it succeeds in removing the dressing. Iodoform should be discontinued when granulation sets in, and boracic ointment used instead. The monkey should be kept in a cage similar to that recommended for its transport, but smaller, and with such modification of details as individual cases may require. An arrangement for securing the patient within a smaller space will be very useful for dressing ill-tempered and intractable subjects. This can be managed by having a piece of board placed inside the cage, breadthwise, so arranged that it can be drawn backward and forward as desired.

OBSERVATIONS ON THEIR HABITS.

The Rhesus and the Macaque monkeys have almost similar habits; they are gentle and playful creatures when young, but become sullen and vicious as they grow old, especially the males. They pass most of their time in alternate fighting and playing; after a violent quarrel they change to the other extreme, and behave as if they were the mildest of creatures. They may be frequently seen picking out the parasitic vermin from one another's fur, and the process appears to be thoroughly enjoyed by the animal subjected to it, stretching itself as it does in a lazy attitude on a perch or shelf. They fight most during feeding time, if not checked by the keeper; but it is not easy, even with close observation, to ascribe a cause for each particular skirmish. The sudden violence of their fury is extraordinary. Animals at one moment living in perfect amity and concord become in an instant deadly foes, ready to tear each other to pieces. The weak or the sickly and the new-comers fare badly. Monkeys of these kinds are proverbially mischievous: they constantly snatch away a stick or umbrella, or even an eye-glass, and when attempts are made to recover the articles their behaviour shows how they enjoy their mischief. Sometimes they appear to rob visitors from simple curiosity and inquisitiveness, and not in a wicked or mischievous spirit. They are also addicted to playing with their drinking water and splashing it about. However quarrelsome and mischievous they may be, these monkeys are generally submissive to their keeper, having by experience learnt to dread his power; but should

a new keeper happen to enter their cage, he is likely to be attacked by the whole troop, led generally by an aggressive old male. Keepers have often been wounded in such outbreaks; but if they are firm and exhibit no nervousness, the monkeys soon recognize their master and resume a peaceful attitude.

Both the Rhesus and the Macaque monkeys are fond of water and swim and dive well. A number of young monkeys (*M. rhesus* and *M. cynomolgus*) were at one time allowed to run loose in the garden; they greatly enjoyed their freedom, and were often seen on a sultry afternoon perched on one of the trees near the Serpentine lake, and jumping one after another into the water and indulging in a swim. On one occasion they appeared to be engaged in a regular diving match; they were divided into two parties, sitting on opposite banks of a narrow arm of the lake. Among their acts of mimicry and mischief noticed from time to time the following may be mentioned. On one occasion, one of them having noticed an official of the adjacent Meteorological Observatory in the act of taking some observation with the aid of certain instruments, proceeded stealthily to the observatory and was seen deliberately to upset one of the instruments. On another occasion one of them intruded into the drawing-room of a lady, then living in the house next to the garden, upset an inkstand and spoiled, it was said, some valuable documents. He did this, it was conjectured, in his uncouth attempt to imitate the lady whom he had observed writing.

A monkey's capacity for showing affection was exhibited in the behaviour of one of a pair of Rhesus monkeys from the Simla Hills, whose companion had been severely wounded and was therefore kept confined in a small cage for treatment. While the patient was in this condition, the one who was still at large and well was much concerned and would sit almost the whole day by the side of the cage and affectionately caress the invalid in various ways through the bars.

(29) THE HIMALAYAN MONKEY.

(*MACACUS ASSAMENSIS*—*McClelland.*)

Description.—An adult Himalayan monkey is larger than a Rhesus; head and body of a full-grown specimen about 20 inches, tail about 9; fur long, wavy and abundant; bare surface of the seat smaller than in *M. Rhesus*; general colour of the body varies from light to dark brown; lower limbs paler; no reddish or yellowish tinge in the hinder parts; face dusky, and never assumes a rufous tinge at any season. This species may be mistaken at first sight for a *M. Rhesus* from Simla or the Naga Hills, as they both possess long and abundant hair; but the tail in this species is somewhat smaller and more slender than in the other.

Hab.—The Himalayas, Assam and Upper Burmah.

LENGTH OF LIFE IN CAPTIVITY.

A specimen obtained in April 1877 lived to January 1880.

TREATMENT IN HEALTH.

Housing.—As the Himalayan monkey is somewhat rare, it is better not to place one, when obtained, with a number of Rhesus or other monkeys of quarrelsome habits. On the other hand, it is equally injudicious to keep a monkey by itself; so that, if a pair be not available, a young M. Rhesus of a docile and tractable nature will suit as a companion. It has been observed that, when kept singly, a monkey is sometimes overrun by parasites, probably for want of the attention of its friends which checks their growth.

Food and transport.—In these matters it may be treated in the same way as a Rhesus. The specimen that lived in the garden never showed any partiality for animal food, in the shape of eggs, insects or minced meat.

OBSERVATIONS ON THE HABITS OF A HIMALAYAN MONKEY.

A young Himalayan monkey is a sociable and affectionate creature, receiving caresses and attention with sympathetic pleasure. It is heavy and slow in its movements, and not given to those active sports in which the Rhesus monkeys appear to be perpetually engaged. The specimen that lived in the garden was in the habit of sucking its thumb, and would move in a kind of rocking manner, accompanied by grins and chuckles.

(30) THE BROWN STUMP-TAILED MONKEY.

(MACACUS ARCTOIDES—*Is. Geoffr.*)

Description.—Larger than the Himalayan monkey, an adult animal standing nearly 2 feet high; thick-set in build; hair long and abundant; hair of the crown slightly parted in the middle, that about the shoulder being wavy, and at the middle of the back parted; tail very short, almost rudimentary; a large area of the seat is bare; colour of the head and body dark brown; in young individuals the lower limbs are paler; face red.

Hab.—High country of Cochin-China, Yunan, Assam (Naga Hills) and Eastern Thibet (Moupin).

LENGTH OF LIFE IN CAPTIVITY.

The longest period during which an example of this species lived in the garden was six years. The specimen now living in the collection was obtained in 1888.

TREATMENT IN HEALTH.

As it resembles a Himalayan monkey in its habits, nothing need be said with regard to housing, feeding, &c.

TREATMENT IN SICKNESS.

The only remark to be made is that the immediate cause of death of members of both these species (*i.e.*, the Himalayan and the stump-tailed) was *cold* in the chest.

OBSERVATIONS ON THE HABITS OF A STUMP-TAILED MONKEY.

In habits it resembles the Himalayan monkey very closely, having the same slow and languid movements. It appears to lose much of the red colour of its face when kept in a place where there is a want of sufficient light. The specimen now in the garden is rather savage in its disposition.

(31) THE LION-TAILED MONKEY.

(MACACUS SILENUS—*Schreb.*)

Hindi—*Shia Bandar*. Bengali—*Nil Bandar*.

Description.—A black-coloured monkey of a slender build. Its chief features are its ruff of light-coloured hair on the chin, throat, cheeks, and temples, encircling the head, and its tufted tail. The ruff does not meet on the forehead. An adult monkey measures about 21 inches (head and body); tail about 13 inches.

Hab.—The forest of the Syhadri Range or Western Ghâts near the Malabar Coast from about 14° north to Cape Comorin, and at a considerable elevation above the sea. Most common in Cochin and Travancore.

LENGTH OF LIFE IN CAPTIVITY.

An adult specimen lived for about six years in the garden, and a pair of adolescent animals have been living since 1888.

TREATMENT IN HEALTH.

Housing.—Adult lion-tailed monkeys are quite capable of defending themselves, and may therefore be kept, if necessary, with the Rhesus and the Macaque monkeys. The younger ones are generally shy and timid, and liable to be maltreated by others if kept with a number; they should therefore be kept by themselves, or with other equally harmless and timid animals. With respect to cold and warmth, they should be treated in the same way as any other monkey of a delicate nature. Although one of the adolescent monkeys now living in the garden has not enjoyed first-rate health, no better accommodation than the Gubbay House (see page 6) could have been provided.

Food.—This monkey should be fed in the same way as other monkeys of the same genus. The younger specimens need careful feeding, as overfeeding has been found to cause flatulent indigestion. It does not seem to care for animal food in any shape.

TREATMENT IN SICKNESS.

The adult lion-tailed monkey, after having lived in good health for about five years, had an attack of *paralysis*, from which it never completely recovered. The symptoms were like those of shaking palsy, which in human beings sometimes results from excessive drinking. In attempting the slightest movement its limbs, body, and even head, would shake. The animal was removed from the monkey-house

and kept in a dry and warm place. No medicine was given internally. One of the specimens now living in the garden has had an attack of *hemiplegia*, from which it is slowly regaining health. The animal was removed to the hospital and kept in a roomy cage with a thick bedding of straw and blanket: its vegetable food was stopped and the animal confined to milk and bread diet; raisins, boiled onions, barley, and eggs being given twice a week by way of change.

OBSERVATIONS ON THE HABITS OF A LION-TAILED MONKEY.

The young lion-tailed monkey is a gentle, timid and inoffensive animal. It does not appear to be as intelligent as many other members of the same genus. Its chuckles are very subdued, and, though quick in its movements, it is not much addicted to leaping and jumping. An older animal is generally ill-tempered, and becomes almost grey with age. This at least was the case with the specimen that lived in the garden for about six years.

(32) THE BURMESE PIG-TAILED MONKEY.

(*MACACUS LEONINUS*—*Blyth*.)

Description.—Stout in build. An adult male measures, head and body, about 23 inches; tail about 8 inches. The hair of the upper part of the back and shoulders longer than that of the lower back and rump; head broad and flat about the forehead, rather tapering about the chin. The thick bushy hair above the forehead is so arranged as to form a horse-shoe shaped crest on each side of the median line. In some the hair surrounding the head is so well developed and thick as to form a kind of ruff, partially concealing the ears; tail short, about one-third of the length of the body, and tapering; general colour dark to light brown. The crest of the forehead, the lower part of the back about the middle line, dark brown; face dusky flesh colour. The females are generally smaller and lighter coloured; the crest and ruff not conspicuous.

Hab.—Arracan and the valley of the Irrawadi.

LENGTH OF LIFE IN CAPTIVITY.

A Burmese pig-tailed monkey has lived in the garden as many as seven years.

TREATMENT IN HEALTH.

Housing.—All the specimens hitherto exhibited in this garden have been lodged in one or other of the cages kept outside the monkey-houses. The adult monkeys have generally shown such bad temper and aversion to their fellow-creatures that it has been found necessary to keep them singly or in pairs. The great drawback, however, to keeping these or other monkeys in such isolated cages is the unavoidable absence of suitable arrangements for their protection from the risks of a changing climate.

Food and transport.—With respect to food, it should be treated like a Rhesus, except that none of these monkeys have ever been noticed to care for animal food. A good cage like that recommended for a hanuman will do for the transport of a pair of them.

OBSERVATIONS ON THE HABITS OF A BURMESE PIG-TAILED MONKEY.

Although sedate and slow, it is never morose. It soon learns to obey its keeper and to perform amusing tricks. One of the monkeys that lived some time in the garden was in the habit of standing upon all fours on the approach of visitors, and having made amusing grimaces would suddenly turn in the opposite direction, and so close the performance.

(33) THE PIG-TAILED MONKEY.

(MACACUS NEMESTRINUS—(Linn.))

Description.—It closely resembles the preceding species, but differs from it in the following respects: it is slightly smaller and a little more slender in make; its muzzle is much produced; it has no horse-shoe shaped crest in front of the crown above the forehead, and no ruff round the head. The general colour of the body brown, having different shades in different parts of it; crown of the head dark brown; a broad dark brown band extends right down the middle of the back; tail slender, short, about one-third the length of the body, and generally twisted like that of a domestic pig.

Hab.—Malayan peninsula, Sumatra, Borneo and Java.

LENGTH OF LIFE IN CAPTIVITY.

One of these monkeys has lived in this garden so long as eight years; another for about four years. A young specimen obtained early in 1889 has now passed into a healthy adolescent state.

Housing.—Some of the pig-tailed monkeys have been found to agree very well with other monkeys. In this respect, therefore, they are easier to accommodate than those which have to be kept singly or in pairs. In regard to cold and damp they require the same careful treatment as most other monkeys.

Food and transport.—The same remarks that have been made with regard to the preceding species apply to this also.

TREATMENT IN SICKNESS.

Paralysis, erysipelas and skin diseases have been met with amongst the specimens exhibited. The animal obtained in 1876 was smitten with *paralysis*. On the malady being detected, the creature was separated from its companions and removed to a spacious cage and kept in a dry place. No treatment was adopted. After having suffered for about six months the animal partially recovered. While suffering from paralysis it became subject to an obstinate kind of *skin disease*, which, however, yielded to the persistent use of borax and sulphur.

In 1882 an adult specimen succumbed to *erysipelas* brought on by injury inflicted by its companion in the adjoining division of the same cage. The wound, which was on the dorsal surface of the right foot, was found to be neither deep nor extensive, so that no serious notice of it was taken, especially as the monkeys had been observed to recover from severer and more extensive injuries without much suffering. On about the third day the monkey was found dead early in the morning, the immediate cause of death being *convulsions* brought on by *erysipelas* which was not detected owing to the presence of the thick fur.

OBSERVATIONS ON THE HABITS OF A PIG-TAILED MONKEY.

The pig-tailed monkey is an extremely amusing animal. Its varied movements and antics, accompanied by absurd grimaces, which it is impossible to reproduce in print, afford a perpetual source of merriment. It appears to be a common habit with all the monkeys of this species to stand half erect on the approach of visitors, hold tight some parts of its lower limbs with each hand, protrude its lips and jerk its head forward several times, and then suddenly turn round or move a few steps to one side. There was once a pig-tailed monkey which had the strongest objection to the folding doors outside the bars of its cage being shut by visitors, and would open them as often as they were closed. As the folding doors were on both sides of the cage, and visitors soon discovered the monkey's weak point, it became a common practice to tease him by shutting the doors, or at least one of them on one side of the cage, while he rushed to open those closed on the other side. Thus two visitors could keep him darting to and fro until he became nearly frantic, and measures had to be adopted to protect him from such persecution. The adult monkeys are in the habit of yawning constantly, exhibiting their formidable canine teeth.

(34) THE BONNET MONKEY.

(*MACACUS SINICUS*—(*Linn.*))

Description.—Slender in appearance. An adult male measures about 19 inches (head and body); tail about 22 inches. Its distinguishing mark is the hair on the crown of the head, radiating from the centre. Colour—body brown; limbs paler; no reddish tinge in the face or about the seat.

Hab.—Southern India.

(35) THE TOQUE MONKEY.

(*MACACUS PILEATUS*—(*Shaw.*))

Description.—The hair of the crown radiating from the centre as in the bonnet monkey is much longer, extending to the forehead to nearly above the eyebrows. Colour slightly darker than in *M. Sinicus*.

This species is readily distinguished from the preceding by the colour of its lips (which are brownish black), and hence popularly designated as "Mishi Bandar"* amongst the native keepers.

Hab.—Ceylon.

LENGTH OF LIFE IN CAPTIVITY.

Both the Bonnet and Toque monkeys have lived for about eight years in the garden.

TREATMENT IN HEALTH.

Housing.—The Bonnet and Toque monkeys have been successfully kept with the Rhesus and Macaque monkeys, which they resemble in habits and movements, so that the remarks made with regard to the *housing, feeding and transport* of the latter apply to the former also.

Breeding.—The Bonnet monkey has bred in the garden, but the young ones did not survive long. The want of success in this respect was attributed at the time to the smallness of their habitation.

TREATMENT IN SICKNESS.

From the similarity of the habits and food of these and the Rhesus and Macaque monkeys, it may be inferred that they are subject to the same diseases also. There is no record of their ever having suffered from any special ailments.

OBSERVATIONS ON THE HABITS OF THE BONNET AND TOQUE MONKEYS.

In habits they are similar to the Rhesus and Macaque monkeys, though less quarrelsome and aggressive. The males of both these monkeys were found to be savage. They easily learn to perform tricks. One of the Bonnet monkeys was extremely attached to its keeper, who taught the animal to beg for food with folded hands.

(36) THE SACRED ABYSSINIAN BABOON.

(CYNOCEPHALUS HAMADRYAS—(Linn.))

It is also called "Dog-faced monkey," "Arabian baboon," and "Hamadryad monkey."

Description.—A full-grown adult male is about 3 feet high when standing erect. The face is long and naked, bearing a resemblance to that of a dog, the snout projecting. The hair of the head, neck and shoulders is long and abundant, and that of the lower part of the body, from the loins downward, is short. The long hair of the head, shoulders and the upper part of the body, forming, as it were, a short cloak, gives a characteristic appearance to the animal. The

* *Mishi-powder* is a composition containing a large proportion of tannin, and used as tooth-powder, specially by a portion of Indian women. It stains the lips black with a ferruginous or rusty tinge.

colour of the body light grey or brown. The tail is about one-half the length of the body and tufted. The female and the young animals have no cloak of long hair. Bare area of the seat large and conspicuous.

Hab.—Abyssinia and Arabia.

LENGTH OF LIFE IN CAPTIVITY.

The maximum period during which an Abyssinian baboon has lived in this garden has been 13 years.

TREATMENT IN HEALTH.

Housing.—The specimen just alluded to has always been kept in one of the isolated cages by itself and has thriven excellently. This may be owing to the hardy constitution of the animal, or to the fact of its having become acclimatized. As a general rule, however, this kind of monkey should be housed in the same way as other African monkeys—that is, a dry, raised place should be assigned to it, and the animal well protected from the extremes of temperature.

Food.—An Abyssinian baboon thrives well on a vegetable diet consisting of fruits, roots, grain, boiled rice, &c. It is not, however, a strict vegetarian, being fond of grasshoppers and eggs; they have been observed to pick up ants and put them into their mouth.

Breeding.—This monkey has never bred in this garden.

Transport.—As some of these baboons have been found to bite through the woodwork of their cages, a light iron cage should be provided when it is necessary to carry them a long distance. Under ordinary circumstances the same instructions as have been given under the Rhesus monkey will suffice.

TREATMENT IN SICKNESS.

None of the baboons that have lived in this garden have ever suffered from any disease calling for special notice.

OBSERVATIONS ON THE HABITS OF A SACRED ABYSSINIAN BABOON.

The sacred Abyssinian baboon, or the Hamadryad monkey, is intelligent, clever and sociable; it is as inquisitive as a Rhesus, but its propensities to mischief are less. Though very active, it is not much addicted to saltatory movements: like a human being, it will sit on a raised place, and will make use of a block of wood or a piece of stone for this purpose: one has been found to use its drinking vessel as a seat. It has an expressive way of calling people's attention by a grunting bark, and, when approached, of expressing its pleasure by a rapid quivering of its lips accompanied by low guttural sounds; if passed by unnoticed, it becomes excited and screams and roars.

It has an equally expressive way of evincing its anger and distrust. A female Hamadryad monkey once became much attached to a cat. A male that lived for 13 years in the garden had a constitutional dread of water, so that it could never submit to being sprinkled with it: advantage was sometimes taken of this weakness to induce it to give

up possession of a stick or an umbrella which it might have snatched from a visitor. The adult females are at times too unsightly for exhibition. The males are apt to take passionate notice of female visitors.

(37) THE CHACMA BABOON.

(CYNOCEPHALUS PORCARIUS—(*Bodd.*))

Description.—This monkey is almost as large as an Abyssinian baboon, which it resembles in general appearance. The distinctive features of a Chacma are its longer muzzle, darker colour, and absence of tuft to the tail. The colour of its body is uniformly dark brown, nearly black in some individuals, mixed with a shade of light yellow. In younger specimens the muzzle is not much produced.

Hab.—West and South Africa.

LENGTH OF LIFE IN CAPTIVITY.

No monkey of this species has as yet lived in the garden longer than four years.

TREATMENT IN HEALTH.

With respect to housing, feeding and transport, it should be treated in the same way as an Abyssinian baboon.

TREATMENT IN SICKNESS.

The specimen that lived for four years died very suddenly one morning, and the cause of death was never ascertained, so that nothing can be said with regard to the diseases from which these animals suffer in captivity.

OBSERVATIONS ON THE HABITS OF A CHACMA BABOON.

The Chacma is as intelligent and clever as the Hamadryad monkey. Though it is generally playful and sociable, its temper is not to be trusted. The Chacma kept in this garden once showed great cleverness in breaking a portion of its cage with the help of an iron scraper which it managed to obtain. It exhibited a singular habit of never touching a plantain unless given with the peel on.

(38) THE MANDRILL.

(CYNOCEPHALUS MORMON—(*Linn.*))

Description.—A full-grown mandrill measures about 4 feet 6 inches when standing upright. It resembles the other baboons in general appearance, but the principal features by which it is distinguished from them are its peak-shaped crest on the crown of the head, the prominent swellings of its cheeks on either side of the nose, the

pointed amber-coloured beard, its projecting muzzle and large lips; the most characteristic points are the swellings on either side of the nose. They are obliquely ridged, and coloured alternately blue and scarlet. The general colour of the body grey, washed with olive brown. The tail is very short. The ridges on each side of the nose are not coloured in young specimens.

Hab. — West Africa.

LENGTH OF LIFE IN CAPTIVITY.

A young mandrill lived for three years and six months in the garden, but this cannot be said to be the maximum period of its life here, as the animal (having been on deposit) was removed after that time. An adult specimen, also on deposit, remained for about six months.

TREATMENT IN HEALTH.

Housing.—The young mandrill was kept in one of the cages of the Gubbay House, and the place appeared to suit it well, as the animal had already grown considerably, and the colour of its cheeks begun to appear when it was removed. The adult baboon lived, as a temporary arrangement, in a large travelling cage, which was of the same style as that recommended for the transport of an orang-outang, but slightly larger.

Food.—The young mandrill throve well on the same diet as is allotted to an orang or a hoolock, but the adult was a great epicure. Its nourishment consisted of a pint of fresh milk and a loaf of bread early in the morning; boiled sweet potatoes, about half a pound, at 11 o'clock; a handful of soaked gram and fruits at 2 P.M., a loaf of bread again at 4 P.M., and a pint of Pilsener beer the last thing in the evening. Little bits of meat were occasionally given which it relished. The animal, it was said, had been accustomed to this kind of feeding from an early age.

With regard to *breeding, transport and diseases* in captivity, there are no remarks to offer.

OBSERVATIONS ON THEIR HABITS.

The young mandrill was gentle and inoffensive at first, but as it grew in age and size it became mischievous and excitable. It was never noticed to be fierce. It amused itself by snatching away bonnets and umbrellas, and had a characteristic way of shaking its head and chuckling, which unmistakably indicated pleasure. The adult was generally grave and sedate, and would sit for hours together in one place. Sometimes, however, he became extremely excited, and on such occasions would violently shake the cage. The approach of a horse and carriage made him angry. He became very restless in the evening, when the time for drinking beer approached, and his restlessness increased with any delay in giving him the beverage.

(39) THE SQUIRREL MONKEY.

(CHRYSOTHRIX SCIUREA—(Linn.))

Description.—Head and body about 10 inches, tail about 14. The little rounded head is much produced on the back; the colour of the body grey, washed with olive; that of the lower parts of the limbs yellow tinged with red; muzzle greyish black; a broad area round the eyes flesh coloured and sparsely covered with fur; lower third of the tail black.

Hab.—Guiana.

LENGTH OF LIFE IN CAPTIVITY.

A specimen has been living in the garden since November 1888.

TREATMENT IN HEALTH.

Housing.—It is kept in one of the small movable cages inside the Gubbay House, and the place appears to suit it well. This little creature is very sensitive to changes of temperature, and it is therefore necessary to protect it from sudden exposure to cold and draughts, especially in winter; during that season the glass doors of this house are closed early in the evening and are not opened till the sun is well up in the morning. A bedding of straw or hay adds much to its comfort.

Food.—Fruits, eggs, insects, minced meat, and occasionally milk and bread.

OBSERVATIONS ON ITS HABITS.

It is a gentle, harmless, playful creature and very affectionate, likes to be spoken to, and appreciates kind attentions; it may be often seen sitting with its tail curling forward and upward, so as to encircle its own body in front; its mode of eating has much resemblance to that of a squirrel. It is sometimes allowed to come out of its cage, but does not go far.

(40) THE WEEPER CAPUCHIN.

(CEBUS CAPUCINUS—*Geoffr.*)

Description.—The characteristic feature of this monkey is its prehensile tail. Its colour is smoky brown, being darker on the top of the head.

Hab.—Brazil, ranging from Costa Rica to Paraguay.

LENGTH OF LIFE IN CAPTIVITY.

A pair have been living in the garden since 1881.

TREATMENT IN HEALTH.

Housing.—Kept in the Gubbay House in the same manner as the Squirrel monkey.

Food.—Fruits, vegetables, eggs, minced meat, and occasionally grasshoppers, milk and bread.

TREATMENT IN SICKNESS.

The only ailment from which one (long since dead) has been observed to suffer was *fits*, which lasted for about five minutes each time. No medicine was given internally, but, as the animal appeared to have been rather fat, its food was reduced. No autopsy having been held after its death, the cause of the fits was not discovered.

OBSERVATIONS ON THE HABITS OF CAPUCHINS.

These monkeys may be seen constantly extending their slender arms in expectation of something from persons approaching their cage. Their manners at such times are extremely expressive of the earnestness of their entreaties; they beg at all times, not only when they are hungry. When food is given, they eat it, if hungry, but not, however, without first carrying it up and down the cage for a few seconds; if not hungry, they smell or nibble at it, break it and throw it down, and return to begging once more. They behave in the same way with things other than food, examining them most attentively and inquisitively. They become so tame that they can be safely let out, and in such cases, instead of going far, generally cling to their keeper. These monkeys become very impatient when they see the keeper feeding the other animals in the same house, and may be observed trying to call his attention by clanking the small chain and padlock with which the cage is secured.

(41) THE COMMON MARMOSET.

(HAPALE JACCHUS—(*Linn.*))

Description.—The size of the animal is about that of a grey squirrel. Its distinguishing features are its long, whitish grey hair on the sides of the head, which conceals the ears, and its long, bushy and ringed tail; its eyes are large and the nose flat.

Hab.—Brazil.

LENGTH OF LIFE IN CAPTIVITY.

The maximum period during which one has lived in the garden has been about eighteen months.

TREATMENT IN HEALTH.

Housing.—Like the squirrel monkey, the marmosets are very sensitive to cold and draughts; their habitation therefore ought to be such as to protect them from the risks of climate. During the cold weather greater precaution is necessary. In addition to the straw or hay bedding, they should have small bits of blankets, under which they may retire of their own accord at night. These animals are extremely shy, and one placed on arrival in a house containing other animals generally refuses to eat, and runs the risk of starvation. Such an animal should therefore be kept under observation for some time, until it becomes thoroughly accustomed to the altered conditions.

Food.—Insects, eggs, milk, raisins, minced meat, bread and sometimes small birds. Bread and milk and either a few grasshoppers or a boiled egg form their usual food in the garden.

OBSERVATIONS ON THE HABITS OF A MARMOSET.

Their principal occupation consists of jumping about from perch to perch and climbing up and down the sides of the cage. They may be sometimes seen nestling under the straw, or in the folds of their blankets.

(42) THE MONGOOSE LEMUR.

(LEMUR MONGOZ—(Linn.))

Description.—Its muzzle is produced and forehead flat and broad. Eyes large; general colour reddish grey; face black; in some there is a band of iron grey colour across the forehead. Tail long and bushy.

Hab.—Madagascar.

LENGTH OF LIFE IN CAPTIVITY.

The longest period during which a mongoose lemur has lived in the garden has been upwards of eleven years.

TREATMENT IN HEALTH.

Housing.—Mongoose lemurs are kept in one of the movable cages inside the Gubbay House.

Food.—Fruits, eggs, bread and milk.

Breeding.—Lemurs have bred in the garden; they have only one young at a birth. When the first event took place, the cage containing the mother and the young was removed to a secluded spot and kept there for about three months until the young was able to shift for itself; the young one clung to the back of the mother for about six months, coming down only when there was no one close by.

TREATMENT IN SICKNESS.

The maladies from which these animals have been noticed to suffer are *inflammation of the lungs; congestion of the liver; skin disease*. With the exception of the last, all of them proved fatal.

OBSERVATIONS ON THE HABITS OF LEMURS.

Lemurs are very sociable active creatures, constantly jumping about or pacing their cages; they carry their long bushy tails curved forward over their back. They may constantly be seen in the act of cleaning their fur.

Although nocturnal in habits in their wild state, they have, it appears, adapted themselves to their changed circumstances and remain generally awake and lively during the day.

The other species of Lemur exhibited in the gardens are—

(43) THE RUFFED LEMUR.

(LEMUR VARIUS—Geoffr.)

Description.—Colour black, with grey whiskers.

Hab.—Madagascar.

This animal has been lately acquired.

(44) THE YELLOW FRONTED LEMUR.

(LEMUR FLAVIFRONS—Gray.)

Hab.—Madagascar.

(45) GARNETT'S GALAGO.

(GALAGO GARNETTI—(Ogilby.))

Description.—Head and body about 10 inches, tail about 12. Its colour is uniform, earthy brown, and hair woolly. Its eyes are large and round; the ears also are large and mobile. Tail long, cylindrical and covered with woolly hair.

Hab.—East Africa.

LENGTH OF LIFE IN CAPTIVITY.

One lived for about seven years in the collection.

TREATMENT IN HEALTH.

Housing.—It was kept in the Gubbay House. This animal sleeps much during the day; it is therefore necessary to keep it in a place where it is least likely to be disturbed by visitors.

Food.—Fruits, vegetables, raisins, milk, bread, eggs, and insects. Its ordinary food consists of a boiled egg, two plantains and some bread, once in the evening. It was never noticed to touch its food until darkness had set in.

OBSERVATIONS ON THE HABITS OF A GALAGO.

The galago is an uninteresting animal for visitors to a menagerie, as it remains quietly asleep almost the whole day; at night, however, it becomes very lively. On awaking in the evening it attends to its personal appearance and then eats its food, always selecting the choicest things first, and then drinks a little water, and remains lively almost the whole night.

(46) THE SLOW LORIS.

(NYCTICEBUS TARDIGRADUS—(Linn.))

Description.—The size of this animal varies a great deal. Some measure as much as 14 to 16 inches, head and body included; others are smaller, being not more than 12 inches. A close woolly fur covers the whole body: the tail is so short that it is almost concealed by the fur. The colour also varies in different specimens; in some it is ashy grey above, and pale below, a brown stripe running down the back from the crown to the loins; round the ears also brown; in others the colour is rufous grey above, and pale below, the dorsal stripe broad and expanding into a patch on the crown.

There is another variety in which the stripe is rather indistinct on the back, but is well marked about the nape, and it bifurcates on the forehead, encircling the eyes.

Hab.—Assam, Sylhet, Rungpore, Dacca, Chittagong, Burmah, Siam, Malacca, Sumatra, Java and Borneo.

LENGTH OF LIFE IN CAPTIVITY.

One lived as many as ten years in the garden.

TREATMENT IN CAPTIVITY.

Housing.—As the habits of this animal are nocturnal, it should be treated like a galago, and kept in a specially quiet place. If this is impossible, a small box for the animal to retire during the day should be provided.

Food.—Eggs, small birds, fruits, bread, young shoots and leaves. A boiled egg, two plantains, a little bread or biscuit soaked in a little milk, constitute its ordinary diet. It is fed only in the evening.

OBSERVATIONS ON THE HABITS OF A SLOW LORIS.

It sleeps the whole day, with the head downward, rolled up almost like a ball. If disturbed it raises its head with a slow deliberate movement, as if with great effort, opens its eyes for a moment, utters a subdued crackling sound, and then rolls itself up again in the same slow and deliberate manner. It becomes most active towards evening when the time for feeding arrives, but its movements are always slow and measured. It is very apt to bite when being caught.

(47) THE LION.

(FELIS LEO—*Linn.*)

Hindi—*Sher-Bubbur*. Bengali—*Singha*.

Lions vary a great deal in colour, size, and expression; some have a deep red chestnut-brown colour; others again are pale yellowish brown. The colour of the mane also varies in different specimens: in some it is a pale yellow; in others nearly black. Faint spots and irregular bands may be seen on the stomach and sides of adolescent and adult animals: the lighter the colour of the animal, the more visible are these spots and bands. In some the muzzle is more pointed than in others.

Hab.—Africa and South-West Asia; Indian lions are now only found in the Gir Forest in Kattywar, Bombay Presidency.

LENGTH OF LIFE IN CAPTIVITY.

The longest period during which a lion has been exhibited in this garden is ten years; this, however, does not represent the maximum length of its life in captivity, as the animal was sent away in exchange while still in the enjoyment of health and vigour. A pair of young animals obtained in 1884 have long since passed into the adult stage and are still flourishing.

TREATMENT IN HEALTH.

Housing.—The lions and other large carnivorous animals are kept in the Burdwan House. It is a semicircular building, 250 feet in length and 32 feet in breadth, divided into eleven double-chambered dens, one in front of the other. The inner chambers, of which the largest is 18 feet by 12 and the smallest 15 by 12, are enclosed on all sides with solid brick



ZOOLOGICAL GARDEN - CALCUTTA.



Photo etching.

Survey of India Offices Calcutta, January 1891.

The Carnivora House.

walls, save where the doors open in front and behind. To give light and air, there is a ventilator on the roof, secured with wrought-iron bars and bolts. The outer dens, which are almost all of equal dimensions, except the two at each end, are closed on three sides and on the top with wrought-iron gratings, the fourth side being formed by the front wall of the inner chamber. The wrought-iron gratings are made of one inch thick rods; those for the front and sides being placed at an interval of three inches apart: the rods are crossed and strengthened by flat iron bars placed at an interval of two feet from each other. A doorway, closed by a suspended grating, communicates between the inner and the outer dens; there is similar lateral communication between the front dens. To prevent the animals from fighting through the bars while in the outer dens, the gratings separating them have been lined with planks. To enable the keepers to get access to the dens for the purposes of cleaning and other work, a man-hole has been provided on the top of each cage. A broad verandah runs along the southern front of the house. Inside each inner den is a wooden platform for the animals to sit or lie upon, and a zinc vessel for drinking-water is clamped on to the grating of the door at the back of the inner chamber.

During the winter all the animals are shut into their inner apartments every night, and are let out to the outer dens much later in the morning than at other seasons. A small quantity of straw is also given them in the outer dens in this season, so that they may sit or lie upon it instead of on the bare cold floor. In the summer and during the rains, unless the day is exceptionally wet, the doors between the inner and outer dens are left open, so that the animals may pass in or out as they wish.

The two sets of dens at the east end of the house are generally assigned to the lions. There is every possibility that a place where a number of large carnivora are kept will become dirty and the atmosphere around it offensive, unless cleanliness is thoroughly and constantly attended to. Early every morning, therefore, the outer dens are swept clean and a weak solution of carbolic acid or phenyle is sprinkled wherever sweepings have to be removed. The animals are then turned out of the inner dens, and, unless the morning is very cold or heavy rain has fallen, these dens are thoroughly washed out, and in cold weather the straw bedding is changed; at about 10 o'clock in the morning the animals are shut in and the outer dens are washed clean: by about 11, when the floors have dried, the grated doors are raised, so that the animals may pass to and fro at pleasure. A jemadar patrols the house always, and the rule is that sweepings should be removed without delay and the carbolic solution applied.

Twice a month all the dens are washed with soap and water. It is also of importance, as a sanitary precaution, to whitewash the walls of the inner dens whenever they become dirty or when a death takes place in any of them.

Food.—Beef forms the principal food of the lions as well as of the other large carnivora. If the meat is good, a daily allowance of 12 to 14 pounds, including the bones, is enough for a full-grown animal; as, however, good beef is dear, and not always obtainable, the quality has to be made up in quantity, and as much as 16 to 18

pounds may be given. At this rate the feeding of each lion costs from Rs. 10-8 to Rs. 12 per mensem. For young lions half the quantity is enough, but the amount should be increased proportionately with the creature's growth. When the necessity for a change of diet is indicated by the aversion of an animal for its usual food, a live kid or fowl or mutton should be substituted for its ordinary diet. Young animals should have live food given them oftener than the older animals. The appetite varies in these as in other creatures. Almost every day a small quantity of fresh *doob* grass should be given; when chewed and swallowed this acts as an emetic.

Breeding.—Lions have not hitherto bred in this garden, but every facility is afforded and hopes of eventual success are entertained.

The *transport* of such a valuable and intractable animal requires careful preparations. A light and strong cage is the principal requisite; one 7 feet long, 5 feet broad, and 4 feet 6 inches high should be provided for a full-grown lion, or a pair of young or adolescent animals. It should be made of three quarters of an inch wrought-iron rods placed at an interval of three inches, and let into a frame of teak wood scantlings. Inside the rods, the two sides and the back end of the cage should be lined with half-inch thick teak or jarul planks, closely joined together, as otherwise the animal will be in a constant state of unrest from various causes of excitement at the different stages of transit; a removable shutter should also be provided for the front of the cage for use when it is very cold or in bad weather. An iron vessel, say 12 inches long by 9 inches by 4 for drinking-water should be introduced through a space left below the bars in front of the cage, and clean water in sufficient quantity given several times during the day, especially after feeding. If lions are sent by sea, the best arrangement for feeding them during the voyage is to send a number of sheep, at the rate of one sheep for two days for each animal, allowing for fasting every seventh day. A sheep weighing from 20lbs. to 30lbs. can probably be had for Rs. 3-8 to Rs. 4 in the local market.

The transfer of a lion from its den to a travelling cage and *vice versa* is a difficult part of the transport operations. The usual method is to keep the animal without food for twenty-four hours and then decoy it into the travelling cage, which is placed with food in it against the door at the back of the inner den. This plan, however, has been found to fail as often as it succeeds. The animal sometimes refuses to move from the corner of the den to which it betakes itself: or it may show great restlessness for food and walk up and down in front of the door, but still decline to enter the cage. If there is no particular reason for haste, the best course is to watch and wait, until at night the animal advances cautiously to steal away the food and can then be encaged. But in urgent cases, where the animal exhibits an unwillingness to move, or to be decoyed, summary means have to be adopted to evict it by fear. It can be frightened by crackers, or a cold water douche, while the introduction of planks inside the den will prevent it from lurking in the corners. On one occasion an ingenious and easy plan was found to succeed with a most refractory animal; a broad plank with hideous and nondescript figures painted upon it with

chalk and coal tar was introduced into the den—the lion fled before it through the open door into the cage outside.

TREATMENT IN SICKNESS.

The diseases from which lions have been observed to suffer in this garden are *paralysis*, *congestion of the lungs*, *dysentery* and *diarrhœa*.

A pair of Indian lions obtained towards the latter end of 1877 became paralysed soon after their arrival. The origin of the malady was never exactly discovered: perhaps their long confinement in a small cage and the exposure incidental to a long voyage by sea round India may have rendered them liable to the attack. When the symptoms of *paralysis* first appeared, every precaution was taken to keep them dry and warm, and, as the animals were young and not at all intractable, anodynes in the shape of camphor and soap liniments were freely rubbed over their limbs with the help of a short mop. No medicine was given internally in the first stage. Live food was given them every day with a view to give tone to their systems. As the malady became alarming, strychnia in $\frac{1}{4}$ grain doses was given morning and evening, but without effect. In spite, however, of careful treatment and nursing, their condition gradually became worse, so that to put an end to their troubles they were shot.

In September 1880 a young lioness died from *congestion* of both *lungs*. Early one wet morning the animal was found lying almost senseless near the door at the back of the inner den, breathing hard and foaming from the mouth. Poultices and fomentation were alternately applied on the chest, carbonate of ammonia and chloric ether in vinegar being internally given every two hours. The animal being exceptionally tame and the sharp attack of the illness having prostrated it greatly, there was no difficulty in administering the medicine; all that was necessary was to slightly lift up its head and pour down the medicine from a small bamboo pail. At one time some hope of its recovery was entertained, but towards the end of the night it became worse and died next morning after having suffered for nearly 24 hours. A *post-mortem* examination revealed extensive congestion of both the lungs brought on by a sudden draught which had probably entered through the latticed shutter of the back door. As a precaution against a repetition of the same disaster, the shutters were all boarded up, and not a single case of sudden death from lung disease has taken place since.

Lately a lion died from *dysentery*. No medicine was given internally, but the beast was fed on live food, until at last it refused to take nourishment in any form. The animal lived for about 17 days without food.

Sometimes *wounds* and *injuries* received accidentally or in fighting give trouble. A young male lion was lately injured in transit by rail from Jconaghur (in Kattywar) to Calcutta, and the severe inflammation which supervened involved one of the eyes also. As the animal was not amenable to treatment by hand, all that could be done was to apply constantly a weak solution of corrosive sublimate (1 in 1,000) with a garden syringe until the inflammation subsided and the wound healed up. The wound, however, broke out again owing to the irritation caused by constant rubbing of the forehead against the iron rods

in front, so that to ensure radical cure the animal had to be kept shut up in the inner den while the treatment was continued.

A LIONESS KILLED BY A TIGER.

On the arrival of a pair of adult lions at the garden they were placed together; as they began to fight it was considered dangerous to leave them in the same den. They were, therefore, temporarily kept apart, the lioness being accommodated in the front portion of the next lateral compartment of the building, in the back portion of which a tiger was securely confined; the latter showed no tendency to be excited. All being satisfactorily arranged the jemadar was allowed to absent himself for a short time, leaving two garden keepers in charge with strict injunctions that no change should be made during his absence. Shortly afterwards a great noise was heard in the direction of the carnivora house, and it was found that the grating door between the two compartments in which the lioness and the tiger had been separated was raised, so that they had come together. The lioness was seen to be dying from injuries inflicted by the tiger; one of the keepers had fled and has never reappeared. A visitor who was present at the time said that the keeper who was missing had volunteered to raise the grating and allow the animals to meet in order to settle a dispute between the keepers regarding the age and strength of the lioness.

OBSERVATIONS ON THE HABITS OF LIONS.

Young lions have sometimes been found to be very tame. A male obtained from Mesopotamia in January 1878 was so good tempered that it allowed itself to be led about the garden with a collar and chain; during the day it remained tied up to a pole under the shade of a tree, and at night slept in a room adjoining that of its keeper. As, however, the beast was fast growing, it was thought undesirable to keep it outside, and it was therefore placed in one of the dens of the Burdwan House (see pages 40-41). It remained comparatively tame until it left the garden in 1887. It appeared to recognize persons, and evinced pleasure at being caressed and stroked through the bars. The animal had become much attached to a particular keeper, whose voice and presence it recognized some four or five years after he had left the service. A young lioness received from the same place was also very tame, and continued so till the end of her short life in this garden. The behaviour of even the tamest lion seems to change, for the moment, at the sight of cattle or a horse. It becomes inordinately excited, walks with nimble steps, follows the direction taken by the cattle or horse, stopping as they stop and moving as they move, rattling the rods of the grating in its quick and excited movement; now crouching down and again springing up as if ready to pounce upon something, the eyes glaring all the while and fixed steadfastly on the object of its attention. At the approach of feeding time lions generally become excited, and their excitement and impatience reach a climax when the bucket containing the food is placed near the den preparatory to distribution; they may be seen clawing at the bars, and in their excitement leaping sideways over one another. Live food, as already mentioned,

is sometimes given to these animals, and it has been observed in this connection that all of them are not equally adept in killing their prey. The tame lion spoken of before held its prey, a kid or a sheep, by the loins, causing it much unnecessary pain and suffering, and otherwise behaved as a most inexperienced beast of prey; whereas another would kill its victim in skilful style, holding it by the throat, and showing great ferocity, excitability and quickness in the operation. Tame lions, which joyfully respond to the attention paid to them, have been found to become cross and irritable at certain seasons. Lions are more noisy than tigers, roaring chiefly in the evening, towards the latter part of the night and in the morning. Circumstances apparently trivial sometimes affect an animal in a most extraordinary and unaccountable way: the old block of wood inside the den of the pair of full-grown lions having become worn-out and thin, a much larger and heavier one was substituted; the lion smelt, examined, and seized it, remained crouching close to its possession, and growled fiercely at everybody who attempted to approach the cage, even resenting the near presence of the female with savage ferocity; it would not stir from the place, so that it was impossible to clean the cage. For further information regarding Lions, Blanford's *Fauna of British India—Mammalia*, and Elliot's *Monograph of Felidæ* may be consulted.

(48) THE TIGER.

(*FELIS TIGRIS*—*Linn.*)

Hindi—*Sher*, *Bāgh*. Bengali—*Bāgh*.

Tigers are subject to great variations in form and colour. Those from the Bengal Sunderbuns have generally a darker ground colour than the denizens of the hill ranges of Central and Southern India: the Malayan tigers again are darker even than those from the Sunderbuns. Some have larger ears with proportionately larger ear spots (white patches outside each ear): the size and form of the head also vary according as the convexity of the forehead and the facial portion is less or more prominent, and the skull broad or narrow. The females are more slender and elongated in form than the males, which are generally heavier in build.

Hab.—The tiger is only found in Asia, and is distributed throughout India, Burmah, South-Eastern Asia, Java and Sumatra; and also throughout China. In Central Asia it is found in the valley of the Amur, the Altai mountains, around Lob Nor in Eastern Turkestan, and on the southern shores of the Caspian. In India it is not confined to the plains only, but is found in the Himalayas, though probably not at a higher altitude than 7,000 feet. Tigers have been received in this garden from the following places:—The Sunderbuns, Dacca, Mymensingh, Tipperah, Rungpore, Malda, Hazaribagh, Ranchi, Sonthal Pergunnahs, Gya, Durbhunga, Dumraon, Mirzapore, Allahabad, Bijour (North-Western Provinces), Travancore (Southern India), Ganjam (Madras), Sumatra, Malacca.

LENGTH OF LIFE IN CAPTIVITY.

The longest period during which a tiger has lived in this garden has been fourteen years. One of a pair of man-eating tigers obtained in 1878 is still alive, and, though old, is in excellent health.

TREATMENT IN HEALTH.

Housing.—As all the larger carnivorous animals are kept in separate lateral compartments of the same house, the remarks which have been made with regard to the housing of a lion apply generally to a tiger also, with such modifications of detail as individual cases may require. Newly captured beasts, for instance, give trouble by refusing to come out during the day, and thereby render it impossible to clean their dens at the appointed hours. This difficulty may be overcome by shutting out the beast at night, when it quietly issues forth from the inner chamber to take the food left in the outer den. If the animal is only shy, but not ferocious, it should be kept out for a day or two or till such time as it becomes absolutely necessary to clean the place. The case is, however, otherwise with ill-tempered and savage beasts. If kept out during the day, they have been known to dash against the bars of the cage with such violence as to mark and injure their foreheads.

Food.—In respect to feeding also the tiger should be treated like a lion, allowance being, of course, made for any individual taste and idiosyncrasy. The garden possessed at one time a tigress which had an insurmountable objection to eating beef. This was attributed to its early habits and dieting on goats' meat. All the larger carnivorous animals are fed once a day, namely, between 5-30 and 6 P.M. during the summer, and between 4 and 4-30 P.M. in the winter. Growing animals or those that are out of condition are fed twice. Once a week they are either starved or kept on half diet, and experience has shown that this system is beneficial to their health. They sometimes voluntarily abstain from food for three or four days without suffering in the least. On such occasions, as has been already remarked, some change should be made in their diet to sharpen their appetites. Having finished their meal, the carnivora drink the water which is always kept in their inner chambers. It is necessary to be very particular in providing good and sufficient water, as they drink much and often. Flowers of sulphur are occasionally given them either in their food or in their water. Sometimes a small lump of it is kept in their drinking vessel. Sulphur acts as a tonic for almost all animals in captivity.

It is necessary to mention here that the buckets used for distributing the food to these animals and the trays used for conveying the meat from the slaughter-house should be washed every day with soap and water, as otherwise they become not only dirty, but offensive to the smell, tainting the meat.

Breeding.—Tigers have several times bred in the garden. The first event took place in May 1880—the female of the man-eating tigers obtained in 1878 giving birth to three cubs. The interval between the delivery of the first two cubs was only half an hour, and that between the second and third an hour and a half. No preparations had been made, and even the obvious measure of removing the male had not been adopted. This, however, was carried out as soon as possible, and should always be done, as the males of some of the mammals, and of *Felidæ* in particular, have a decided propensity in some cases to devour their offspring. To ensure perfect solitude and stillness at a time when the tigress was naturally irritable, the cage was barricaded

in front and behind, and *durmah* screens were put up against the iron gratings in front. To avoid giving her any cause of annoyance, the cleaning of the cage, however necessary, was held in abeyance for some time, only the remnants of food and sweepings were occasionally removed with care from outside.

In about three weeks the young creatures began to move about freely, rendering it necessary, the *durmah* screen having been already removed, to enclose the front of the cage up to a certain height with wire so as to prevent their tumbling out through the bars. The third cub, which had been in a weak state of health since its birth, died at a month old. The two survivors thrived well under careful management. When about four months old they were separated from their mother and from that time were fed chiefly on live food for about three months more. To this judicious feeding was mainly due the healthy condition to which they attained.

Two cubs born to a young tigress in May 1886 unfortunately survived only six days. In April 1889 the same tigress gave birth to two cubs, which have enjoyed excellent health. The cubs were allowed to remain with their mother longer than those born in 1880. It was interesting to observe the behaviour of the tigress towards her offspring at the different stages of their growth. When the cubs were three months old the mother showed great solicitude in watching their infantile efforts at eating the small quantities of fresh mutton given them as food, but her behaviour towards them soon altered, so that, when they were five or six months old, she invariably quarrelled with them at feeding time, until it became necessary to separate them permanently. This tigress being an extremely nervous animal, the *durmah* screen had to be kept up for about five months. The period of gestation in this case was 106 days.

Transport.—The observations recorded with reference to the transport of lions apply to tigers as well. On several occasions a splendid tiger has reached the garden in a maimed condition, either having broken a tooth or received wounds on its body. This is liable to occur when the construction of the cage is defective. In examining the cause of the loss of a canine tooth of a large tiger it was found that the hoop iron bands with which the battened cage was bound inside were torn to pieces, and the broken tooth was fixed like a wedge between one of the corner posts and a piece of iron band still attached to it by a large projecting nail. Such a case shows how essential it is, before sending an animal on its journey, to see that the cage is free from nails or projections which may endanger life or limb; the better plan, however, is to send one of the travelling cages for the conveyance of the beast.

TREATMENT IN SICKNESS.

Tigers have been observed to become subject to *rheumatism*, *fatty degeneration*, *intestinal worms*, *tumours*, *growth of nail into the flesh of the pad*, *epilepsy*, and other complicated diseases.

Rheumatism is probably brought on by the animals constantly lying on the cemented floor of the den; their liability to this complaint has, however, been reduced to a minimum by the simple plan of giving each animal a platform to sleep upon. It is, of course, impossible to compel an animal to make use of the platform when provided, and

there have been refractory and stupid animals which would persist in lying on the floor.

Adiposity has sometimes proved fatal. A nearly full-grown male having died rather suddenly in October 1885, a *post-mortem* examination was held, which showed that almost all the viscera of the animal were embedded in masses of fat. This was no doubt caused by over-feeding and want of exercise.

A *nail* sometimes grows *into the flesh of the pad*, which festers, unless it is cut and removed in time. This happened to an old man-eating tiger, rendering the animal lame and miserable for some time. To facilitate the operation of cutting the nails a special cage was built with a proper device of a moveable frame inside the cage, for securing the animal within a small space: the operation was then performed and the wound dressed. In about ten days the animal was completely cured. The best way, however, to prevent claws from growing in is to put a log of wood in each cage so that the animal may scratch it whenever it likes.

Worms sometimes prove very troublesome to these beasts. When they are noticed or suspected a dose or two of *santonine* (grs. 4 to 5 in each) will be effective. The easiest method of administering *santonine* is to mix it with double or treble the weight of flowers of sulphur, and give it concealed in a small piece of meat when the animal is hungry. It is better to do so on a fasting day, as the animal should have no food for about twelve hours before and after the *santonine* is given. A small lump of black salt may be left inside the den, and if the animal licks it the action of *santonine* is hastened.

Tigers have sometimes been observed to suffer from *tumours* or swellings at the joints, but the nature of these growths has never been ascertained.

The following report of an autopsy performed upon the body of a tigress which died in November 1878 from the effect of some lingering illness (of which no accurate diagnosis could be made) shows that these animals in captivity sometimes die of complicated diseases:—"Heart and lungs healthy, liver slightly congested, gall bladder full of bile, and hepatic duct obstructed towards its termination. In the intestines there was a constriction about three inches above the rectum, and about an inch and a half above it, the mucous lining presented a thickened appearance. On opening this, small pieces of bone were found in different stages of disintegration impacted in an ulcerated surface. The kidneys were abnormally large, the cortex peeling off on being touched; on opening them longitudinally patches of hardened granular deposits were found all over the surface. Right ureter about three and a quarter inches below the kidney was also full of the deposit."

An adolescent tigress has lately become subject to a kind of *fits*, which come on every second or third day, sometimes oftener: for the moment its limbs become paralysed and the whole body convulsed. The nature of the disease has not been determined. (This animal having since died, an autopsy was held and its stomach and intestines were found to be full of small round worms.)

Several cases of severe *wounds* have occurred among the tigers in this garden, but almost all of them have recovered under careful treatment. The general principle observed in the treatment of their wounds

and injuries is to prevent their getting fly-blown, and with this object a weak solution of corrosive sublimate (1 in 1,000 or 1,500) is constantly applied by a garden syringe. Where the patient is tame or young it is taken out and kept in a cage, and the wound dressed several times during the day, so long as granulation does not set in.

OBSERVATIONS ON THE HABITS OF TIGERS.

Tigers differ in temper and habits as much as they do in their external appearance. Some are comparatively good-tempered, others cross and sulky. Those brought up in captivity are generally milder in disposition, and are sometimes tame enough to allow the keepers and others to handle them, but their temper can never be absolutely trusted. It is a marked peculiarity of tigers that even the tamest become savage at feeding time. An instance, on the other hand, is known of a tigress dropping the food which it had in its mouth and hastening to receive the caresses and attentions to which it was accustomed almost every morning. As specimens for exhibition in a menagerie, tigers which are not shy and do not object to visitors standing near the cage are always more valuable than newly-caught beasts, which being wild and timid can seldom be seen to advantage. They either pass their days in the inner den, or, if shut out, lie motionless in one corner of the den, or remain in a chronic state of fury and alarm. Some take a long time to become accustomed to their altered situation, others soon become reconciled to their new surroundings. Some tigers have been found to be in a very nervous state on arrival, and remain so for a long time; others never become habituated to captivity at all. One of two tigresses from Ranchi simply starved herself to death, although everything possible was tried to induce her to eat and take to her new home. Her companion, who was equally alarmed at first, and for whose life also very slender hopes were entertained, at last yielded to the temptation which live kid and fowl daily offered. Apparently trivial cases sometimes frighten an otherwise tame tiger. A perfectly tame young tiger was living in the garden some time ago; the animal having been in the habit of lying on the wet floor of the outer den every morning, it was decided to place a wooden platform there, in addition to the one already provided in the inner chamber. Although there was nothing peculiar about the new platform, which had been made in the same style as the one it was accustomed to sleep upon every night, the sight of it appeared to frighten the poor animal out of its senses: it became terribly alarmed and jumped about the cage in great excitement, till at last it rushed with tremendous force into the inner compartment, from which it did not emerge for several days. When the platform was removed the animal became quiet again. Even the most ferocious tigers are great cowards, so that they soon begin to dread the cane and recognise its authority.

Tigers often fight each other through the bars which separate their outer dens. Serious consequences having sometimes resulted from some of these quarrels, the grated partitions were at first boarded up to about 3 feet 6 inches from the floor. This was, however, insufficient to check their pugnacious propensities effectually. Being determined to fight, they would manage it either by standing on their hind legs or sometimes by suddenly jumping up against the gratings

and clawing each other through the upper bars, the narrow ledge formed by the cross flat bars giving them a temporary support. It was therefore found necessary to complete the boarding almost to the top of the cage. Tigers are less noisy than lions. Their call, which is a deep prolonged growl, is generally heard in the evening.

Anecdote.

The escape of two tigers is worthy of mention. On the 23rd January 1877, two tigers escaped at about 6 P.M. from the Burdwan House while some of the officers connected with the garden were standing in front of one of the dens. The keepers, who were on the roof of the house engaged in raising the gratings to let the animals into their inner dens, first noticed the escape. The officers rushed to the opposite end of the building to verify the fact, and having ascertained its truth beat a rapid retreat towards the nearest bird-house, and thence towards the entrance gate, discussing the steps to be taken for keeping the animals within the garden enclosure during the night and securing them, if possible, in the morning. It was decided to keep the roadside lamps of the garden burning and to maintain perfect silence inside the garden, so as not to disturb or terrify the beasts. The news of the escape soon spread in the neighbourhood; the shops were closed and the bazars presented an unusually deserted appearance early that night. Meanwhile at the request of the Commissioner of Police, to whom a report had been conveyed, a company of sepoy of the regiment stationed in the immediate neighbourhood was turned out to form a cordon round the garden, with orders to continue shouting and yelling the whole night. This plan succeeded admirably. The tigers remained inside the garden and abstained, while at large, from killing or molesting a single animal, although they had ample opportunity of doing so. This unexpected moderation on their part may be ascribed to their freedom from hunger, as they had been fed immediately before the escape, or more probably to their astonishment and alarm at the novelty of their situation. In their rambles one of the tigers twice passed quite close to the Superintendent of the garden, who was seated in the small ticket office made of *durmah* mats only—there was no entrance-lodge then—to keep himself informed of the movements of the beasts, with the help of the two keepers watching them from the top of the Burdwan House. It was a clear moon-lit night, and the trees and shrubs in the garden were then still small. About midnight both the tigers retired inside the walled enclosure (to the west of the Burdwan House) which was at that time unoccupied. Hopes were then entertained of securing them in the morning, and, everything considered, the position of the house at one corner of the enclosure with sliding doors, the height of the wall (7 feet as it was then) and the nature of the beasts, there would have been a good chance of capturing them. The Commissioner of Police, however, decided in the interests of the public safety to run no further risks, marshalled his forces on the roof of the Burdwan house at 5 A.M., and at the third volley the beasts fell. This is the only tiger-shooting on record so near to Calcutta.

Enquiry was, of course, made as to the cause of the escape. The Burdwan House had not then been finished, and it transpired that the

masons, who had been engaged in the inner dens that day had, when they stopped work in the evening, left the back doors of two of the inner compartments open. The keepers who were then inexperienced and untaught did not notice the open doors as they ascended to the roof, so that on reaching the top they raised the gratings as usual to allow the tigers to retire into their sleeping dens, and the tigers had nothing to do but to walk straight out of the cages by the back way.

(49) THE LEOPARD.

(*FELIS PARDUS*—*Linn.*)

Hindi—*Kendwa Bagh*. Bengali—*Chita Bagh*.

The leopard is well known in Lower Bengal. Its size is variable, some specimens being as large as 8 feet from the tip of the nose to the end of the tail; another animal of the same age, however, may measure much less. The height at the shoulder also varies from 1 foot 6 inches to 2 feet. Three varieties of leopards have been received in the garden. The largest in size has a comparatively short tail, and clearly marked spots on a pale ground colour; it has a broad head, and in many specimens the fold of skin at the throat presents the appearance of a dewlap. The smaller variety has a comparatively long tail, and a decidedly rounded head; its limbs are short, approaching, in this respect, to the jaguar's, but wanting the robustness of the latter. The third is from Africa, and has an albescent ground colour; the spots are also very clearly defined. To these may be added the black variety of leopard, of which the spots are distinctly visible through the black ground colour which is deep in some specimens and light in others. The young leopards are of a dirty brown colour and the spots are not well marked; this is partly due to the fur being very rough in the young ones.

Hab.—India generally, Malayan peninsula, Java, Sumatra, Burmah, Northern China, Persia, Africa generally. Leopards have been received in the garden from the following places: Dacca, Mymensingh, Tipperah, Barisal, Jessore, Buxa Dooars, Julpigori, Kuch Behar, Assam, Rungpore, Dinagepore, Rajshahye, Nuddea, Moorshedabad, Malda, Purneah, Bhagulpore, Beerbhoom, Sonthal Pergunnahs, Midnapore, Orissa, several districts of Behar, Rajputana, Oudh, North-Western Provinces, and East Africa.

LENGTH OF LIFE IN CAPTIVITY.

The maximum period of life of a leopard in this garden has been fourteen years. An adolescent leopard obtained in 1876 died in April 1890. Those that once overcome the nervousness due to the new surroundings amidst which they find themselves on arrival generally do well.

TREATMENT IN HEALTH.

Housing.—As a rule all the adult leopards are kept in one or other of the double-chambered dens of the Burdwan House, and are treated in the same manner as the lions and tigers. Half a dozen of them

generally live together in one set of dens, the black leopards being always lodged separate from the others. New arrivals, when very young, are mostly accommodated in small cages and kept inside the hospital or some other suitable place.

Too much care cannot be bestowed in securing them in their prison, as they have a wonderful capacity for escaping through small spaces and climbing to incredible heights to find means of exit. The rods of the iron gratings of their dens ought not to be more than three inches apart anywhere, either in the front, or sides, or the top. As leopards are, when at liberty, in the habit of climbing trees, stout ramified trunks have been placed in their outer dens, and the animals have been constantly observed extended at full length along a branch, or curled up in a fork.

Food.—Six pounds of beef, including bones, suffice for the daily food of an adult leopard, and at this rate an animal's food costs about Rs. 6-12 per month. But the appetite of individual animals varies, so that it is impossible to lay down a hard-and-fast rule in this respect. There have been leopards which would eat as much as 8 pounds. Leopards, with the rest of the animals in the same house, are fed in the evening at the hour indicated on page 46. As more than one pair generally live together in the same set of dens, some of them are shut into the inner, and others left out in the outer den during feeding-time to prevent their quarrelling over the food. Leopards do not appear to drink as much and as often as tigers. Pariah dogs were, at one time, tried as food for the leopards, but though, in their wild state, they are accustomed to kill dogs for food, the same diet did not appear to agree with them in captivity; so that the idea of feeding them on dog's flesh had to be abandoned. Those that are sent to the garden after having been kept as pets have to be fed upon boiled meat, at least for some time after their arrival. Either they altogether refuse to eat raw meat or it disagrees with them.

Transport.—All that has been said with regard to the transport of a lion or tiger applies to a leopard also. As, however, the leopard is a much smaller animal, the travelling cage should be proportionately diminished. Greater precautions are necessary in transferring a leopard from its den to the travelling cage. Whoever superintends the operation should satisfy himself that the cage is firmly placed against the door of the den, and that there are no spaces whatever between the cage and the door so as to allow the beast to escape into the open; it is incredible, as intimated above, through how small a space and how stealthily a leopard can manage to escape. If (as for instance, at the Calcutta garden, when the sliding wooden protector, which is outside the grated door of the den, is raised) a space is left between the cage and the wall of the den, this should be closed in also, because the leopard on stepping out from the den (or the travelling cage, as the case may be), generally looks up and, if it finds an open space above, is sure to climb up with a view to escaping. Leopards are sometimes sent from the interior of the country in bamboo or old rickety cages. This is a specially dangerous method of transport, as the cage is subjected to much jolting and oscillation in the course of transit. When, therefore, the offer of an animal is accepted, enquiry should be

made as to the suitableness of the travelling cage, and if it turns out to be unsatisfactory, a proper one should be sent for the purpose.

Breeding.—Leopards have bred in the garden; the principal hindrance, however, to their breeding more freely than hitherto is the want of room to keep them in pairs. Cubs have been known to be killed and eaten by other leopards living in the same den. They have, however, been successfully reared by carefully separating them with the mother at, or soon after, birth.

TREATMENT IN SICKNESS.

They are subject to all the diseases from which lions and tigers suffer in captivity, and are amenable to the same treatment. As a number of them live together in the same den, and as they are rather quarrelsome animals, *wounds* and *injuries* are often met with among them.

OBSERVATIONS ON THE HABITS OF LEOPARDS.

The agility of the leopard is remarkable, and in general it is a more active animal than either a tiger or a lion; at the same time it is bolder and decidedly more pugnacious, especially the black variety. If taken young and fed upon boiled meat and milk it remains very tame up to a certain age, but its temper can never be absolutely trusted. Leopards are fond of climbing trees and basking on the branches in the sun. Sometimes, though rarely, a leopard has been observed to make immense bounds. A black leopard once made an attempt to escape through the bars of the roof of its outer den, which is over 18 feet high; to this height the animal attained partly by jumping and partly by climbing up the grated partition. Some of the leopards, especially in the early days of their incarceration, hide themselves in the small square masonry tank in their outer dens or under the wooden platforms in the inner. The leopard is not a noisy animal; it sometimes calls at night.

(50) THE OUNCE OR SNOW-LEOPARD.

(*FELIS UNCIA*—*Schreb.*)

Description.—Smaller than a leopard. Head and body about 4 feet 4 inches, tail 3 feet, height about 2 feet. It has dense woolly fur, the ground-colour is pale whitish grey, sometimes with a yellowish tinge; white below. There is a median dark band from near the middle of the back to the root of the tail; the rest of the body spotted. Ears black, each with a large yellowish spot.

Hab.—The ounce is found throughout the Himalayas at high elevations, and is more common on the Thibetan side of the Snowy range, where it is met with in the Upper Indus and Sutlej valleys. It is fairly common in Gilgit. Young snow-leopards are sometimes captured near Almora and sent down to the plains for sale.

A snow-leopard has never been obtained for exhibition in this garden. A specimen was brought down from Almora for transmission to the Zoological Society's Garden, London, but it died from *heat*

apoplexy within a week after its arrival. It may be remarked in this connection that the best time to bring them down is during the height of the cold weather in the plains, and even then it is necessary to be extremely careful. Its transport ought to be so arranged that it may be despatched to England as soon after its arrival in the plains as possible.

(51) THE CLOUDED-LEOPARD.

(*FELIS NEBULOSA*—*Griffith.*)

Description.—Size of a small leopard; the characteristic features of this animal are its colour and the markings of the body, the former varies from earthy brown to light yellowish brown; the lower parts of the body and the inner side of the limbs whitish; the markings of the body are very irregular, the head and limbs being spotted, and the sides divided into irregularly-shaped elongated patches by narrow pale coloured bands; tail ringed with black marks. Irregular black marks across the throat.

Hab.—South-Eastern Himalayas, Sikhim, Bhutan, at moderate elevations, Assam hills, hilly parts of Burmah, Siam, the Malay peninsula, Sumatra, Java and Borneo.

LENGTH OF LIFE IN CAPTIVITY.

A specimen obtained in 1887 lived for about two years.

TREATMENT IN HEALTH.

Housing.—As the animal is essentially arboreal in its habits, it ought to have branches of trees in its cage, and there ought to be a box for retirement. Like the lynx and caracal, it requires to be kept apart from the other smaller carnivorous animals, as it evidently dislikes the smell which is unavoidably perceptible in a structure occupied by a large number of smaller carnivora.

Food.—Beef has been found to disagree with this animal. It thrives best on fowls, pigeons, and rabbits given alive, but this kind of feeding is necessarily expensive. Mutton agrees with it better than beef, but it is expensive also. No clouded-leopard has ever bred in this garden.

Transport.—A box, 4 feet long, 3 feet broad, and 2 feet 6 inches high, made of planks on three sides and iron bars about 2 inches apart in front, will do for transporting a clouded leopard.

TREATMENT IN SICKNESS.

The diseases from which these animals have been observed to suffer are *tumour* on the head and *dysentery*.

A young animal obtained in 1880 suffered from a *tumour* on its head, which rendered it partially blind. The tumour was opened and its contents—a quantity of straw-coloured fluid—let out, but after some time it formed again and ultimately the animal died from its effects.

OBSERVATIONS ON THE HABITS OF A CLOUDED-LEOPARD.

The specimen obtained in 1880 was very tame; it used to purr like a cat when stroked and caressed. Its chief delight, however, was to ascend a tree, and remain hidden away amongst the foliage. The specimen which was obtained in 1887 never became thoroughly reconciled to its new home; it disliked being looked at by visitors, and to show its resentment occasionally struck the rods with some violence.

(52) THE MARBLED CAT.

(FELIS MARMORATA—*Martin.*)

Description.—It resembles a clouded-leopard in its markings, but is much smaller, the length of the head and body being 18 to 22 inches, and that of the tail 14 to 15½ inches. The tail is not ringed like that of the clouded-leopard, but spotted on its upper surface. It is an extremely beautiful animal.

Hab.—Sikhim, Eastern Himalayas, hilly ranges of Assam, Burmah, and the Malay countries, Sumatra and Java.

A specimen lived for about six weeks in the garden. This particular specimen was accustomed to feed on a live chicken every night, and was extremely pugnacious in temper.

(53) THE GOLDEN-CAT.

(FELIS TEMMINCKI—*Vig. & Horsf.*)

Description.—Its form is elongated. The length of head and body about 31 inches, tail about 19 inches, height at the shoulder about 17 inches; colour of the back dark chestnut; sides pale ferruginous; whitish below. There are some irregular spots on the breast, a white or buff-coloured stripe runs from below the eye to behind the gape; a whitish band inside each eye. Ears black or brownish black outside. The colour of some of these creatures is dark brown instead of chestnut.

Hab.—South-Eastern Himalayas, Tenasserim, Sumatra, and Borneo. Both the specimens that lived in this garden were obtained from Tipperah.

LENGTH OF LIFE IN CAPTIVITY.

The maximum period during which a golden-cat has lived in this garden has been five years.

TREATMENT IN HEALTH.

With respect to *housing, feeding and transport*, it may be treated in the same way as a clouded-leopard.

TREATMENT IN SICKNESS.

Both the specimens exhibited in the garden died somewhat suddenly, and no *post-mortem* examination was held, so nothing can be recorded under this head.

OBSERVATIONS ON THEIR HABITS.

Both the specimens that lived in this garden were unsuspicious in their movements, never resenting the approach of visitors near their cages. Both appeared to be more active than other cats during the day. One of them had a habit of hiding its food under the straw bedding and eating it at night.

(54) THE FISHING-CAT.

(FELIS VIVERRINA—*Bennett.*)Hindi—*Baraun, Ban Bilai.* Bengali—*Ban Bidal.*

Description.—Larger than a domestic cat. Head and body about 30 inches, tail about 11, height at the shoulders from 12 to 15 inches. Colour of the upper part of the body dark or earthy grey, lighter or almost whitish below. Body and limbs covered with spots of varied size and distinctness. Five to six, sometimes eight, black lines on the head run backwards to the nape, and on reaching the shoulder are broken up and continue as dotted lines to the lower back. There are two horizontal cheek bands, one from behind and another from below the eye; there are also some cross bands on the throat. In some specimens the limbs are spotted and in others marked with spotted lines. Tail ringed above, the tip of the tail black, penultimate portion whitish.

Hab.—Indian and Indo-Chinese subregions of the Oriental region. Bengal, probably Orissa, and the Indo-Gangetic plain generally, extending as far as Sindh. Malabar coast, from Mangalore to Cape Comorin, Ceylon. Along the base of the Himalayas, as far as Nepal; throughout Burmah, Southern China, and the Malayan peninsula. Said to exist in Formosa.

Fishing-cats have been received in this garden from the following places:—Calcutta, 24-Pergunnahs, Nuddea, Jessore, Rungpore, Purneah, Malda, Rajshahye, Assam, Chittagong, Midnapore.

LENGTH OF LIFE IN CAPTIVITY.

The maximum period during which a fishing-cat has lived in the garden has been ten years and a few months.

TREATMENT IN HEALTH.

Housing.—Fishing-cats, together with other smaller carnivorous animals, are kept in the Kuch Behar House. It is a lofty, spacious and open bungalow, giving shelter from sun and rain to a double row of cages, which are raised on iron supports three feet above the floor of the house; the central passage separating the two lines of cages is used by the keeper for the purpose of cleaning and feeding, while the deep verandah outside affords shelter to visitors. Each row of cages is divided into eight compartments, communicating with each other by sliding doors. The compartments are each 8 feet long, 5 feet broad, and 4 feet high, and are built of stout wire netting fastened to a strong iron frame. To protect the animals from cold and draughts,

light plank screens are hung up outside the cages, which may be let down when occasion arises; inside each cage is a box, open on one side, wherein the creatures can retire. Thorough and effective cleaning is necessary to keep down the smell arising from the presence of so many odoriferous animals in one place, and for this purpose one of the compartments of each row is generally kept empty, so that, during the time of cleaning and washing the cages in the morning, the animal in the adjoining cage may be driven into it and the cage thus emptied washed and cleaned, the same process being repeated until the last one is finished. Although this arrangement involves some waste of space, it ensures more thorough cleanliness than could be achieved with the presence of the animal in the cage, and saves it from exposure to wet which it naturally dislikes, especially during the cold weather. Moreover, it is not always safe to allow a keeper, and more particularly if he is new to the work, to enter the animals' cages, as their temper can never be perfectly trusted.

The smell emanating from these animals cannot, however, be altogether removed by the most assiduous efforts. Newly captured and young cats should not be placed on arrival in a building with others, but kept in a retired place unfrequented by visitors, until they recover from their nervousness and cease to fret on the approach of the keeper. These cats sometimes fight with other animals through the wire-netted partitions of their cages; it may be necessary to add planks to the netting, but this should be avoided as much as possible, as being an obstruction to ventilation. During the cold weather a thick layer of straw is, in addition to the bedding, laid on the roof of each row of cages to keep them warm. Once every week the sleeping boxes are taken out and allowed to soak in the water for an hour or two and then washed with soap. Dry earth is sometimes used with success as a disinfectant during the winter and summer, but altogether discontinued in the rains.

Food.—Beef and fish constitute their principal food in captivity. An adult cat should get about one pound of beef and about half a pound of fish every evening. The cost of feeding a full-grown cat is about Rs. 4 per mensem. Doob grass, sulphur, and salt should be given them in the same way as to the lions and tigers. Like all other animals, these cats require change of diet, so that chickens, pigeons, and (rarely) rabbits are sometimes given them. Young specimens are fed on milk, boiled meat, &c., several times during the day. Some of the adult animals have been observed to relish land and fresh-water snails.

Breeding.—Fishing-cats once bred in the garden, but unfortunately both the young ones were devoured by the male parent.

Transport.—A box 3 feet long, 2 feet 6 inches broad, and 2 feet or 18 inches high, made of deal planks on three sides and $\frac{1}{4}$ inch iron rods in front, will suit for the conveyance of a couple of these cats. Such as are still wild, having only been recently caught, rarely survive a journey by rail or sea. Care should, therefore, be taken to send only those that have lived for some time in captivity and become accustomed to the presence of men. Fish diet is not absolutely necessary for them, so that it can be dispensed with in transport.

TREATMENT IN SICKNESS.

Diarrhœa and *dysentery* are the principal diseases from which these animals have been observed to suffer. The treatment adopted is chiefly dietetic; sometimes the animals themselves abstain from food. A live chicken or a pigeon checks *diarrhœa* in mild cases.

OBSERVATIONS ON THE HABITS OF A FISHING-CAT.

Some of these animals have been found to be savage and bold, others good tempered, though not tame. They generally snarl and spit on their cages being approached or retire inside their sleeping box. None of these cats have ever been noticed to purr. In their movements they are not so agile as some of the other wild cats. They mostly sleep during the day, but become active towards the evening.

(55) THE LEOPARD CAT.

(*FELIS BENGALENSIS*—*Kerr.*)

Description.—This beautiful cat varies a good deal in size and shades of colour. A full-grown animal measures, head and body, from 24 to 26 inches, tail about 11 inches. Ground colour above pale yellow in some, rufous grey in others, below white or whitish. Four black lines run backwards from the head, and being broken up at the nape continue down to the back as dotted lines; the cheek bands meet the line crossing the throat. Black spots on the sides of the shoulders and body. Spots of the limbs smaller. The spots of the body have generally a linear arrangement. The arrangement of spots varies also in different specimens.

Hab.—Himalayas as far west as Simla; Lower Bengal, Assam, the Burmese and the Malayan countries. Southern China, Sumatra, Java, Borneo, and the Philippines. The Syhadri Range or Western Ghâts of India, Coorg, Wynaad, Travancore, Vizagapatam.

Leopard cats have been obtained from Assam, Darjeeling, Penang, Dacca, Rungpore, the Sunderbuns, Sumatra, &c.

LENGTH OF LIFE IN CAPTIVITY.

None have lived more than four years in this garden.

TREATMENT IN HEALTH.

Housing.—The Kuch Behar House (see page 56) in which these animals are kept does not appear to suit them.

Food.—Beef, their principal food here, does not seem to agree with them. Sparrows and other small birds are occasionally given, and are much relished.

Transport.—A cage about the size of that recommended for the Fishing-cat, and of similar construction, will do for the transport of a pair of these cats. Both the Fishing and the Leopard cats are in the habit of striking at the bars of the cage. It is, therefore, much better to have the roof of the cage made of rods instead of the front.

TREATMENT IN SICKNESS.

The remarks made with regard to the Fishing-cats apply to these also.

OBSERVATIONS ON THEIR HABITS.

Of the several specimens exhibited, none have ever been found to be tame. They invariably remain in their sleeping box during the day, becoming livelier towards the evening. Very shy and suspicious. More active and lighter than the Fishing-cat.

(56) THE RUSTY SPOTTED CAT.

(FELIS RUBIGINOSA—Is. Geoffr.)

Description.—The size of this small cat is less than that of an ordinary domestic cat. Head and body about 16 to 18 inches, tail about 9. "General colour pale yellowish brown, covered sparsely with reddish spots. The usual stripes over the head and down the back of the neck dark brown, sometimes extending the length of the back, or broken into oblong spots towards the hind quarters. Line between the nose and the eye, lips, throat, breast and entire underparts pure white, faintly barred upon the breast with rufous, inner side of front legs crossed with two bars of blackish brown; belly spotted with the same, and inner side of hind legs crossed with two bars of dark rufous brown. Two lines of red cross the cheeks, one starting from behind the eye, the other just below, and extending beneath the ear. Tail, slender, rather long, same colour as the back, unspotted. Back of ears black, with a rufous spot in the centre. Paws and the lower parts of the legs yellowish."—*Elliot*.

In the specimen exhibited here the lines crossing the cheeks were rusty brown in colour.

Hab.—Southern India and Ceylon.

LENGTH OF LIFE IN CAPTIVITY.

A specimen lived for about eighteen months.

TREATMENT IN HEALTH.

With regard to *housing, feeding and transport*, it may be treated like a Leopard cat.

OBSERVATIONS ON ITS HABITS.

The specimen exhibited was very shy and retiring, remained crouched on a shelf in one corner of the cage and never came down during the day. It was very light and nimble in its movements.

(57) THE JUNGLE CAT.

(FELIS CHAUS—*Güld.*)

Bengali—*Khâtās*.

Description.—Slender in build. Size, head and body about 22 inches, tail about 11; height at the shoulder 15 to 16 inches. In some

specimens the ears have a few long hairs, but not forming a tuft. Colour of the body varies from dark brownish grey to yellowish; limbs and flanks are generally lighter coloured than the back. Transverse bands are sometimes visible on the limbs. Tail ringed with black towards the end, tip black. In some specimens the markings are conspicuous, in others absent.

Hab.—Common all over India, ascending the Himalayas to 7,000 to 8,000 feet. Burmah, Ceylon, North-Western Asia, and Northern Africa.

LENGTH OF LIFE IN CAPTIVITY.

Although living in a wild state, probably within half a mile of the garden, it does not appear to thrive well here. The longest period during which one lived in the garden has been only a little over five years.

TREATMENT IN HEALTH AND SICKNESS, AND TRANSPORT.

In all these respects it may be treated in the same way as a Fishing-cat.

OBSERVATIONS ON ITS HABITS.

In its habits it closely resembles the Fishing-cat; those exhibited were however found to be less addicted to spitting and snarling than the Fishing-cats.

(58) THE CARACAL.

(*FELIS CARACAL*—*Güld.*)

Hindi—*Siah-gosh.*

Description.—Slender in form, with long limbs. An adult animal measures, head and body, 26 to 30 inches, tail about 9 inches. General colour reddish brown, without spots, below white. Back and tip of ears black. Its principal features are the long pointed tufts of the ears. Lynxes from different localities vary in colour, some being dark, others lighter; faint markings are sometimes visible.

Hab.—Punjab, Sindh, North-Western and Central India. Outside India it occurs in Mesopotamia, and perhaps in the highlands of Persia, in Arabia and throughout a large part of Africa (*Blanford*).

LENGTH OF LIFE IN CAPTIVITY.

The damp moist climate of Lower Bengal does not agree with this animal, so that of the number of specimens exhibited none has lived more than three years.

TREATMENT IN HEALTH.

Housing.—The specimens exhibited were mostly kept in the Kuch Behar House (see page 56). Although the want of success in keeping caracals does not appear to be due to any defects in the habitation, it is in contemplation to try the experiment of keeping them in isolated cages.

Food.—A caracal should be fed on live fowls, pigeons, rabbits, &c. ; beef should be avoided as much as possible.

Transport.—May be treated like any other large cat.

TREATMENT IN SICKNESS.

Diarrhœa and *dysentery* are the principal diseases from which these animals have been observed to suffer. They rarely recover.

OBSERVATIONS ON THEIR HABITS.

Some specimens have been found to be tame enough to allow themselves to be stroked, but most of them snarl and spit on the approach of men. They are in the habit of constantly pacing their cages, whether tame or wild. Unlike many other cats, a caracal does not appear to become lively towards evening; in fact they have on several occasions been observed to sleep at night while other cats were awake and lively.

(59) THE LYNX.

(*FELIS LYNX*—*Linn.*)

Description.—A very heavily built cat. Head and body about 33 inches, tail about 7; height at the shoulder about 18. The tufts of hair at the end of each ear are long, pointed and black. A ruff is formed by the long hair of the hinder part of the cheeks. Fur soft and woolly. Limbs powerful and paws massive. The colour of the animal varies from isabelline grey to rufous fawn: the flanks and limbs are marked with faint brown spots. In the specimen which lived in the garden the summer coat was short and smooth, and the ruff and the ear tufts were not conspicuous; during the winter the coat changed considerably, the hair becoming longer, softer and very dense and paler in colour; the ruff and the ear tufts were also very conspicuous in winter. The terminal half of the tail black. In European specimens, known as the red lynx, the colour is generally brownish red with distinct black spots at certain seasons of the year.

Hab.—Upper Indus Valley, Gilgit, Ladak, Thibet, throughout Asia north of the Himalayas, and Europe north of the Alps.

LENGTH OF LIFE IN CAPTIVITY.

A specimen lived in the collection from January 1878 to February 1884. This, however, does not represent the maximum length of its life in captivity, as the animal was sent away while still in the enjoyment of health and vigor.

TREATMENT IN HEALTH.

Housing.—During two years it remained under private treatment, was tied up in the shade, and never allowed into the sun. The success which attended the rearing of this animal was attributed to this precaution, as the animal was an inhabitant of a very cold region. At night it slept in the stable. It was bathed every morning with soap

and water, and wiped dry with a towel. At the end of 1879 it was removed to the garden; but, as it had been accustomed to live in comparative seclusion and was suspicious of strangers, it was housed in a place adjoining the garden not accessible to the visitors: from thence it was occasionally taken to the garden for exhibition.

Food.—One and a half pounds of boiled beef morning and evening, and a pint of fresh milk in the morning only. The usual practice was to feed it in the morning immediately after the bath, and again at 7 o'clock in the evening. A basin of pure drinking water was always kept near it.

Transport.—Under ordinary circumstances it may be treated like any other large cat. The arrangements, however, for transporting such a creature ought to be somewhat special. Precaution should be taken that it may not be exposed to the sun. To ensure proper cleanliness, which is absolutely necessary for an animal accustomed to be bathed and washed every morning, the cage should be made with double compartments, so that, while one is being cleaned the animal may be shut into another: the inner retiring room, which may also be used for shutting it in in bad weather, should be made of planks attached to a light wooden frame, and the outer room of $\frac{1}{4}$ inch iron rods on three sides and of planks in the floor and roof. Water should be frequently given, but not always kept inside the cage, as otherwise the floor of the cage will remain constantly wet, in consequence of the rolling of the ship, rendering it uncomfortable for the beast to sit or lie upon. A quantity of dry earth may, if possible, be supplied, in a shallow earthen vessel, which if kept in one corner of the cage, the lynx will probably make use of it. To be fed as usual.

TREATMENT IN SICKNESS.

The lynx above mentioned once met with a serious accident, fracturing its left thigh bone. It happened thus. Wishing to stalk some passing cat, it sprang over the railing of a lower verandah and was nearly strangled by its chain. When lifted up it was found that the left thigh bone was fractured. It was laid down carefully on its right side, and with great docility the animal maintained this position for weeks until the fracture had united. While a patient, it permitted itself to be carried about from place to place, and purred with pleasure when it received more than usual attention.

OBSERVATIONS ON THE HABITS OF A LYNX.

It slept much during the day, but was generally lively at night. It would make occasional springs, and was pleased with the attention of the persons whom it knew, and allowed itself to be handled like a dog. It was known to recognize persons after long absence, purring and leaning against its friends and otherwise indicating pleasure at the interview. It was sometimes very noisy at night. Though accustomed to be bathed almost every morning, it was afraid of being sprinkled with cold water. It hated domestic cats, and on one occasion very nearly killed one which imprudently came too near its kennel with a view perhaps to purloining the remnants of food.

(60) THE PUMA.

(FELIS CONCOLOR—Linn.)

Description.—About the size of a leopard, but slender in build. Head and body about 4 feet, tail about 2 feet 4 inches. General colour rufous brown, darker on the tail. Cheeks, upper lip, chin, throat white; breast and under parts generally albescent. On each side of the upper lip is a black mark, somewhat of a crescent shape. Lower part of the tail black: colour varies in different seasons. Young pumas are spotted.

Hab.—North and South America.

LENGTH OF LIFE IN CAPTIVITY.

A specimen lived for about eighteen months.

TREATMENT IN CAPTIVITY.

It may be housed and fed in the same manner as other carnivorous animals already mentioned.

TREATMENT IN SICKNESS.

The animal after its arrival in the garden was never perfectly healthy: it suffered off and on from *diarrhœa* and *dysentery*, to which it ultimately succumbed. The treatment applied was chiefly dietetic, live fowls, pigeons, and even kids, being given at intervals. The *post-mortem* examination showed ulceration of the lower part of the intestines.

OBSERVATIONS ON THE HABITS OF A PUMA.

Owing probably to the indifferent state of its health, it was never very lively; neither was it very good tempered. Sometimes at night it uttered a shrill, piercing cry, but was generally silent. This beast was found never to sleep upon the wooden platform, but preferred the floor of its sleeping apartment. When this was observed to be its invariable practice, a bundle of straw was given for bedding even during the summer, and good use was made of it. It was much addicted to paddling the water of its drinking vessel.

(61) THE JAGUAR.

(FELIS ONCA—Linn.)

Description.—In general appearance a jaguar resembles a leopard, from which it can, however, be readily distinguished by its short and massive limbs and paws, its bull-dog head and powerful jaws, and lastly by its spots, which are arranged in rosettes, with a single spot within each ring. The ground colour of a jaguar is generally darker than of a leopard. The average size of this creature is about 4 feet from the nose to the root of the tail; tail about 2 feet; height at the shoulder from 18 inches to 2 feet.

Hab.—America.

LENGTH OF LIFE IN CAPTIVITY.

A pair have been in the garden since January 1890.

TREATMENT IN HEALTH.

With respect to *housing, feeding and transport*, the jaguar may be treated like any other larger carnivorous animal. As the male is the more powerful of the two, it was observed to appropriate the food of the female, after having eaten its own, so they had to be fed separately.

TREATMENT IN SICKNESS.

During the short time that they have been living in the garden, the jaguars have maintained excellent health.

OBSERVATIONS ON THE HABITS OF JAGUARS.

These animals were very shy on their arrival, and continued so for some time. They appeared after a time to have become bolder, so as not to run away to the furthest corner of the cage on the approach of men; they similarly learnt to obey their keeper. Though not generally noisy, their call is more sonorous and deep than that of a leopard. One of the favourite fancies of the male is to carry a large log of wood backward and forward several times during the day.

(62) THE OCELOT.

(*FELIS PARDALIS*—*Linn.*)

Description.—This is the most variable of cats, no two specimens being alike in markings and colour. Fur soft and short, general colour rufous white or whitish; sometimes rufous yellow; head, neck, shoulders, and back marked with black spots or lines: flanks and loins striped with broad black lines: limbs spotted and more rufous in colour; under parts white; chest and belly spotted; a black line crosses the throat beneath the cheek and passes down to the throat. Tail long, with irregular shaped bands and spots; towards the end blackish. A full-grown animal measures, head and body, about 29 inches; tail about 16. The colour of the specimen that lived in the garden was light grey.

Hab.—America.

LENGTH OF LIFE IN CAPTIVITY.

An ocelot lived in this garden a little over nine years.

TREATMENT IN HEALTH.

In respect of *housing, feeding and transport* it may be treated like any other cat. The comparatively long period during which this animal lived has probably been due to its being fed on live rabbits or guinea pigs almost once a week. It ought to be remembered that flesh-meat often induces *diarrhœa* in cats, and with some it disagrees more than with others. They often eat bits of bread, biscuits and other sundries.

TREATMENT IN SICKNESS.

Severe cold and inflammation of the lungs are the diseases from which an ocelot has been observed to suffer, the latter ending fatally.

The *cold* was accompanied by slight cough and much sneezing. The animal was not removed to another place, but, to protect it from probable risk of climate and to keep the place as warm as possible, canvas screens were hung all round, and a very thick straw bedding was provided. For the first three or four days the animal ate absolutely nothing, but when it had partially recovered its appetite chicken soup and milk were given. Except a dose of castor oil (half an ounce) in milk, no medicine was internally administered. During the time the ocelot remained ill the washing of its cage was altogether suspended. In about a fortnight the animal completely recovered.

OBSERVATIONS ON THE HABITS OF AN OCELOT.

The specimen exhibited in the garden was a playful, active creature; when not asleep it was hardly ever at rest. It found great amusement in setting some wooden balls rolling, and watching them in motion, sometimes from one side and sometimes from another, and, when they stopped, in setting them in motion again. Anything tassellated or pendant greatly excited and amused this animal, so that, when tired of playing with the balls, it would betake itself to the bunch of jute which hung from the roof of its cage. It was extremely tame and purred like a domestic cat when pleased at the attention paid to it; but it once betrayed such ferocity, its great tameness notwithstanding, that all confidence in the animal's temper was lost. A boy-keeper of some fifteen years of age cleaned its cage every morning, and was very friendly with the animal. While engaged in his usual work one morning, the ocelot attacked him savagely and literally tore open his scalp, inflicting at the same time other less severe wounds. Having regard to the manner of attack as described by the boy, it was conjectured that the pendant locks of his hair, set in motion by the movement of his body while sweeping out the cage, attracted the beast, and that the resistance which the boy naturally offered exasperated it, and its native ferocity of temper was aroused.

(63) THE DOMESTIC CAT.

(*FELIS CATUS* VAR. *DOMESTICUS*—*Erxl.*)

Several varieties of domestic cats have been exhibited: the Persian cat with lengthened fur; the Malayan cat with truncated tail,—some of these having short and peculiarly twisted tail; and the semi-domesticated Indian cat with grey-ground colour and black stripes, supposed to be derived from the *Felis viverrina*. A Thibetan cat with an ashy coat has been living in excellent health for the last year.

(64) THE HUNTING LEOPARD.

(*CYNÆLURUS JUBATUS*—*Schreb.*)

Hindi—*Chita*.

Description.—Head and body about 4 feet, tail about 2. Slender in body and lanky in limbs. Head round and much smaller than that of a leopard. Fur generally coarse, hair about the neck and belly somewhat lengthened and shaggy. General colour above and on the sides

tawny or rufous fawn, pale below; almost the whole body covered with small round spots; chin and throat not spotted. A black line runs down from the corner of each eye to the upper lip. Tail spotted above, imperfectly ringed below.

Hab.—Africa, South-Western Asia, India. In India hunting leopards are found in the Punjab, Rajputana, Central India, as far east as the confines of Bengal.

LENGTH OF LIFE IN CAPTIVITY.

A pair from Rajputana lived for about four years in this garden, and a single specimen from Africa has been living for more than a year.

TREATMENT IN HEALTH.

Housing.—The specimens from Rajputana were housed in the Burdwan House (described on pages 40-41). As these animals were trained for hunting, and accustomed to be kept on *charpoy*s, this mode of confinement evidently did not suit them. One now living in the garden is lodged in a smaller house and appears to be happy. This house is built on the same plan as that assigned to the Orang-outang, but smaller; it has the indispensable wooden platform in the sleeping or inner den. In their wild state they live in dry places, and it is therefore necessary that they should have dry accommodation in captivity also. This is specially requisite in a climate like that of Bengal.

Food.—The specimens from Rajputana were fed on beef, cut up into small bits, without any bone; the one now in the garden is fed on mutton, beef having been found to disagree with it.

Transport.—Chained and hooded, they are sometimes conveyed from place to place on *charpoy*s placed on carts, but this mode of transport is only possible when the animal is well trained and in constant charge of keepers all the way. A pair of them were once brought down in this way from Jeypore. For ordinary purposes a cage should be provided, and, as the animal is extremely timid and excitable, should be boarded with planks on all sides with the necessary apertures for ventilation.

Breeding.—Chitas have never bred in this garden, and as far as known they seldom breed in captivity.

TREATMENT IN SICKNESS.

Diarrhœa is the only disease that has been met with in this species, and it yielded to change of diet.

OBSERVATIONS ON ITS HABITS.

Gentle in disposition, but timid and excitable. Anything unusual excites it: it has generally a terrified look.

(65) THE LARGE INDIAN CIVET.

(VIVERRA ZIBETHA—*Linn.*)

Bengali—*Bâgdans*.

Description.—The head and body elongated, muzzle produced, limbs short, back slightly arched, and a crest of erectile hair along its

whole length. General colour dark grey; a black band runs along the middle of the back, corresponding to the crest. In some specimens the sides of the body are marked with indistinct spots and "eyes." (In none of the specimens that have lived in this garden have these spots or "eyes" been observed.) Upper parts of the limbs distinctly barred; lower parts of the same colour as the body. Front and sides of the neck and chest white; a broad, black band crosses the neck, forming a collar; the black band is so wide that the white parts before and behind it appear really as two white bands crossing the neck. Ears small; tail ringed white with intervals of broad, black bands. An adult animal measures, head and body, about 32 inches; tail 18. Some are much lighter in colour than others.

Hab.—Bengal, Assam, Burmah, the Malayan peninsula, Siam and Southern China. Common in the neighbourhood of Calcutta.

LENGTH OF LIFE IN CAPTIVITY.

The longest period during which one of these animals has lived in the collection has been nearly thirteen years.

TREATMENT IN HEALTH.

Housing.—The specimens exhibited in the garden have all been kept in the Kuch Behar House (see page 56). As these animals sleep much during the day, a large wine box with one side open will be much appreciated by them as a retiring place. A piece of hard stone is useful for them to scratch their nails upon.

Food.—They are almost omnivorous. Their food consists of about half a dozen to eight plantains in the morning, and about a pound and a half of beef, either raw or boiled, according to their individual taste in the evening; biscuit or bread is sometimes substituted for plantains. Land and fresh-water snails, frogs, lizards, eggs and small birds are equally acceptable to them. The specimen that lived for thirteen years in the garden was fonder of a vegetable than an animal diet, and ate large quantities of bread and biscuits.

Transport.—It may be treated like any of the cats mentioned before.

With regard to *Breeding* and *treatment in sickness*, there are no observations to record, as none of them ever bred in the garden, nor is there any experience of their illness and its treatment.

OBSERVATIONS ON THE HABITS OF A LARGE CIVET.

The large civet, in captivity, is quiet and undemonstrative. Although none have ever been found to become tame enough to respond to friendly attentions, yet on the other hand they are never savage and fierce, as some of the cats are found to be. They sleep much during the day, becoming livelier at the hours of feeding and at night. Their natural activity has often been noticed to be roused at the sight of a sparrow or a lizard in or near the cage. They do not appear to be quarrelsome, or mischievous, like the palm civets. The odour of these animals is neither so strong nor so offensive as that of palm civets or ratels. Large civets are, on the whole, very cleanly in their habits.

(66) THE MALAYAN CIVET.

(VIVERRA TANGALUNGA—Gray.)

Hab.—India, Sumatra, Malayan peninsula, Burmah. As this animal lived only for a short time, in 1877, no special experience was acquired.

(67) THE SMALL INDIAN CIVET.

(VIVERRICULA MALACCENSIS—Gmel.)

Bengali—*Gandha goula*.

Description.—Elongated and slender in form. Head and body about 21 to 23 inches, tail 15 to 17 inches. A specimen now living in the garden measures approximately, head and body, 20 inches; tail 14 $\frac{3}{4}$. General colour of the body brownish grey or pale yellowish brown; five to seven dark-brown longitudinal bands on the back, and several rows of spots on the sides. A dark stripe crosses the throat, and two from behind the ears pass on to the shoulder. Tail ringed alternately black and white. The colour and markings vary in different specimens, and from the observations taken of the creatures exhibited in this garden it is certain that many of them change colour at different seasons of the year: confinement appears to have some effect upon their coating.

Hab.—With the exceptions of Sindh, the Punjab, and the western parts of Rajputana, it occurs throughout India. Found in Ceylon, Assam, Burmah, Southern China, the Malay peninsula, Java, Socotra, Comoro Islands, and Madagascar. Often captured in the neighbourhood of Calcutta.

TREATMENT IN HEALTH.

Housing.—The specimens exhibited in the garden have been kept in one of the cages of the Kuch Behar House. As they are lightly-built animals and somewhat inquisitive, they are likely to escape through the gratings of a cage if the latter are not sufficiently close, and it is therefore better to keep them in cages made of wire netting. A small deal wood box, full of loose earth, and some hay or straw, may be given them as a retiring place, so that they may burrow in the earth if inclined to do so.

Food.—May be fed on a mixed diet consisting of meat, boiled or raw, eggs, plantains, and other fruits and bread: in fact it, like a large civet, eats anything.

Transport.—A small deal cage, 2 feet long, 1 foot or 15 inches broad, and about as high, will comfortably accommodate a pair of these animals. As they are not amiable in disposition, when wild, two or more animals of unknown temper should not be put together.

TREATMENT IN SICKNESS.

Diarrhœa is the only disease from which some of these animals have been noticed to suffer, and in such cases either the food was stopped for a day or two or a change of diet prescribed.

OBSERVATIONS ON THE HABITS OF A MALAYAN CIVET.

The Malayan civet is active and inquisitive, and is easily tamed. It remains coiled up in its box during the greater part of the day: even a tame one is seldom seen pacing the cage when there is nothing to attract its attention. Compared with the size and bulk of the animal, its footfall is heavy. It is extremely dexterous in killing rats and guinea pigs, holding its prey by the neck and not leaving it until dead.

(68) THE COMMON GENET.

(GENETTA VULGARIS—(Less.))

Description.—Head and body elongated. General colour yellowish grey; body black-spotted; tail ringed with white and black bands; tip whitish. A black stripe runs along the middle line of the back.

Hab.—South Europe, North Africa and Asia.

LENGTH OF LIFE IN CAPTIVITY.

A specimen lived for about six years.

TREATMENT IN HEALTH.

It may be treated like the Malayan civet.

OBSERVATIONS ON ITS HABITS.

Resembles the Malayan civet in its habits, but less retiring in disposition, although never very tame.

(69) HARDWICKE'S HEMIGALE.

(HEMIGALEA HARDWICKII—(Gray.))

Description.—The specimen exhibited was not quite full-grown when obtained: it measured, head and body, about 18 inches; tail about 15. General colour pale yellow, with black-brown stripes on the head and nape; across the back are five or six black bands; the lowest portion of the tail, or more properly its base, is ringed; its terminal portion black. Head conical, body long, and the back slightly arched.

Hab.—Borneo, Malacca.

May be treated like the Malayan civets and genets.

OBSERVATIONS ON ITS HABITS.

Though small, it is a fierce animal. The specimen under notice slept much during the day, but was awake and lively at night. It was never seen to touch its food before darkness had come on. When fed upon live food, it attacked its prey with surprising ferocity and quickness. The footfall of this animal was also noticed to be heavy.

(70) THE INDIAN PALM CIVET.

(PARADOXURUS NIGER—*Desm.*)

(71) THE MALAYAN PALM CIVET.

(PARADOXURUS HERMAPHRODITUS—(*Pall.*))Bengali—*Bham*, *Bhondar*, *Gandagaula*.

These two species (70 and 71) are so much alike that they may be mentioned together. They have the same synonyms in Bengali, and no specific distinction is recognized. They are so common and well known that any description is unnecessary. They appear to differ in the following respects :—

Muzzle.—That of the Indian palm civet, produced and narrow; of the Malayan shorter.

Tail.—About as long as the head and body, and well clad with hair in the Indian civet; in the Malayan species, about three quarters the length of the head and body, and not so well clad with hair.

The colour and fur.—The general colour of the Indian species is blackish grey to brownish grey, and fur long, coarse and abundant; the colour of the Malayan palm civet is brownish grey, sometimes ashy, and fur less abundant.

Stripes and markings.—Vary in both the species. In the Indian species the stripes on the back are generally indistinct or wanting; in the Malayan palm civets the longitudinal stripes on the back are well marked, the sides of the body often spotted, and the upper parts of the limbs barred. The young specimens of the Indian palm civet are also striped and spotted. No white band across the forehead in the Indian species; in the Malayan there is. Both the species are subject to much individual variation with regard to their stripes and other markings.

Hab.—The Indian palm civet is found throughout India, with the exceptions of the Punjab and Sindh; rare in North-West Provinces, Bombay, the Deccan; it is also found in Ceylon. The Malayan palm civet is found in Bengal, Burmah, Siam, the Malayan peninsula, Sumatra, Java and Borneo. Both the species occur side by side in Lower Bengal. Animals of intermediate forms, *i.e.*, resembling both these creatures, are also very common. Palm civets have been received from the following places :—Calcutta and its neighbourhood, Dacca, Mymensingh, Ceylon, Midnapore, Madras, Burmah, Gya, Malda, &c.

LENGTH OF LIFE IN CAPTIVITY.

Although so common and living in a wild state within the garden, these animals do not appear to bear captivity well, so that none of them ever lived for more than five or six years.

TREATMENT IN HEALTH.

Housing.—The palm civets are kept in the Kuch Behar House. As they are extremely quarrelsome creatures, it is advisable to keep

only a pair in one cage; otherwise they fight and injure each other to a serious extent. That none of these animals has ever lived for more than five or six years is, to a great extent, due to this fact. Either the new arrivals should be refused a place in a garden, or kept in separate cages. A small box for the animals to sleep in during the day is indispensable. As they are arboreal in habits, a branch of a tree stuck inside the cage will be much appreciated by them.

Food.—The usual food of palm civets in captivity consists of boiled meat, fruits and eggs; but they are omnivorous, and would eat almost everything. Entrails of fowls or pigeons, frogs, snails, &c., are sometimes given as a change of diet. Boiled rice, fish and vegetables are also acceptable to them.

OBSERVATIONS ON THE HABITS OF PALM CIVETS.

Coiled up inside the box or in one corner of the cage, palm civets pass most of their time during the day in sleep, gathering carefully round them the straw, hay or dry leaves provided for their bedding. They have a prehensile tail, although they do not all appear to possess it in the same degree, and this limited prehensile power of their tail may be observed when one has to be dislodged from a forbidden place of refuge. As a last resource it holds on with the end of its tail to anything it may chance to find. The palm civets emit an offensive smell owing to their possession of odour glands, and their presence in a bush or tree is easily perceived from this cause.

(72) THE HIMALAYAN PALM CIVET.

(*PARADOXURUS GRAYI*—*Bennett.*)

The chief features of this species are its uniform grey colour, and its woolly fur. Some specimens are much lighter in colour than others: the terminal half of the tail in some is black; head, with the exception of the forehead, ear, and chin, brown or blackish: a broad band below each ear and a narrow line down the nose and a spot below each eye; the whiskers are white.

Hab.—Assam, Sikkim, Nepal, Arracan, and the Andaman Islands. Specimens have been received from Darjeeling and the Andaman Islands.

LENGTH OF LIFE IN CAPTIVITY.

One lived for about five years.

TREATMENT IN HEALTH.

May be treated like the other palm civets. Those obtained from Darjeeling should not be exposed to sun, but kept in a cool place. It is well, if possible, to keep a civet like this, which is very cleanly in its habits and does not emit much offensive odour, in an isolated cage under a tree, or some other sheltered spot.

Food.—Beef should be avoided as much as possible, and this presents no difficulty, as the animal thrives well on fruits, bread, milk and eggs. Live sparrows and small chickens, occasionally given, will do it much good.

Transport.—May be treated like cats: those from the Himalayas should receive special attention.

OBSERVATIONS ON ITS HABITS.

It resembles other civets in habits, but does not, however, appear to be at all pugnacious. Specimens obtained from Darjeeling lose much of their woolly fur during the summer.

(73) THE WHITE-WHISKERED PALM CIVET.

(PARADOXURUS LEUCOMYSTAX—*Gray.*)

This differs from the preceding species in being a larger animal; its colour is reddish brown, the muzzle paler.

Hab.—Malacca, Malay Archipelago, and Tenasserim. A specimen was obtained in 1877 from the Karen Hills, Burmah.

TREATMENT IN HEALTH.

It may be treated like other civets.

(74) THE SMALL-TOOTHED PALM CIVET.

(ARCTOGALE LEUCOTIS—(*Blyth.*))

Description.—The dimensions of an adult animal are—head and body about 25 inches, tail about 27 inches. Fur smooth, colour yellowish or brownish grey: three longitudinal black bands or lines of spots run along the back: a white line on the forehead, running down to the nose: tips of the ears in some specimens white.

Hab.—Assam, Sylhet, Tipperah, Arracan, Tenasserim, Malacca, Sumatra, and Java. Specimens have been obtained from Burmah, Tipperah, Assam.

Note.—There is nothing special to record of this animal.

(75) THE BEAR-CAT OR BINTURONG.

(ARCTICTIS BINTURONG—(*Raffles.*))

Hindi—*Bhāl-billi* or *Kālā Bhāl-billi*.

Description.—It resembles both a civet and a bear in general appearance. Has a conical head, broad at the base and tapering towards the muzzle. Ears small and covered with long hair, which forms a pencilled tuft at the ends. Whiskers long and numerous. Tail very long, prehensile, and covered with long hair: body also covered with long coarse hair. General colour grizzled black: the head and the lower parts of the limbs grey. Hair at the middle of the back parted.

Hab.—Assam, Arracan, Tenasserim, Siam, the Malayan peninsula, Sumatra, and Java. A specimen said to have been captured in Bhutan was obtained in 1882.

LENGTH OF LIFE IN CAPTIVITY.

A specimen, obtained in 1883, is still alive.

TREATMENT IN HEALTH.

Housing.—In providing accommodation for a binturong, three points should be borne in mind ; it is a nocturnal animal ; arboreal in habits ; and those obtained from Sumatra and Java do not stand much cold. Binturongs kept in one of the cages of the Gubbay House have been found to thrive. Here they have a dead trunk of a tree which they can climb at pleasure, a top shelf for retirement and sleep during the day ; and the house, while well protected from cold, is at the same time airy during the summer. As, however, this house is principally intended for delicate monkeys and lemurs, room is not always available for a binturong, and they are, therefore, often accommodated in one of the cages of the Kuch Behar House (see page 56). To give them some seclusion during the day when kept here, it has been found advisable to let down half of the plank screen outside the cage ; a sleeping-box, of course, is indispensable.

Food.—Boiled meat (beef or mutton), eggs, small birds, fruits, bread, boiled rice, biscuits, milk, &c., constitute its principal diet in captivity. Eight to twelve plantains or some dates or other fruits and a bit of bread or a little boiled rice, in the morning, between 8 and 9 A.M., and from a half to one pound of boiled meat in the evening will be enough for an adult animal. Eggs, small birds, insects, should be occasionally given as a change of diet. Some of the binturongs were observed to have a strong partiality for a fruit diet consisting of oranges, plantains, dates, &c., and lived for months without even touching meat. None of the binturongs exhibited here appeared to like fish, although some of them were fond of land and fresh-water snails.

Transport is easily managed : a box like that recommended for the transport of a fishing-cat, with a shelf on one side, is all that is required.

TREATMENT IN SICKNESS.

Convulsions and *fits* are the principal diseases from which binturongs have been noticed to suffer in captivity. As the animals, in almost every case, died suddenly, while apparently in the enjoyment of health, no treatment was ever attempted. The binturong appears to be one of the animals which have a special tendency to become fat, probably owing to want of sufficient exercise.

OBSERVATIONS ON THE HABITS OF A BINTURONG.

A binturong is nocturnal in its habits, sleeping during the greater part of the day and becoming lively at night. Its movements are slow and somewhat cautious. None of the animals exhibited appeared to be savage, though some were shy and suspicious : on the other hand, several of them have been observed to get remarkably tame. They are very cleanly in habits, spending much of their time after their meals in cleaning their faces and lips.

(76) THE SMALL INDIAN MUNGOOSE.

(HERPESTES AUROPUNCTATUS—(*Hodgs.*))Hindi—*Neula*. Bengali—*Beji*, *Newl*.

(77) THE COMMON INDIAN MUNGOOSE.

(HERPESTES MUNGO—(*Gmel.*))

Both these mongooses (76 and 77) are so common in Bengal that no description is necessary.

Hab.—The small Indian mongoose is found in the Lower Himalayas from Sikhim to Kashmir, in the North-West Provinces, the Punjab, Sindh, Beluchistan, Kandahar, Southern Persia. It is common in Lower Bengal, and is found as far south as Midnapore. It is also found in Chittagong, Cachar, Assam, and Upper Burmah, and also in Arracan, Pegu, and the Malayan peninsula. The common Indian mongoose has also an extensive range of distribution, being found throughout the Peninsula of India and in Ceylon also. On the west it extends as far as Sindh, Afghanistan, and probably Beluchistan. It is found in Bengal and Assam: not so common about Calcutta as the small Indian mongoose.

LENGTH OF LIFE IN CAPTIVITY.

The longest period during which a small Indian mongoose has lived in the garden has been six years and a few months: the common Indian mongooses have been very short lived, none having survived more than two years.

TREATMENT IN HEALTH.

Housing.—Arrangements similar to those recommended for housing a small Indian civet or a genet will be found to answer well for these creatures. A small isolated wire cage, with a proper roof and good canvas screens as protection against cold and draughts, and a small box inside for the animals to sleep in, placed under the shade of a tree, and standing on wooden legs some three feet above ground, or on a brick platform of the same height, is by far the best accommodation for a pair of mongooses. Mongooses are very quarrelsome animals, and therefore there ought not to be more than a pair in any single division. They should have a thick bedding of straw to lie upon.

Food.—Minced meat, eggs, small birds, insects, bread, plantains, &c., form the ordinary diet of a mongoose in captivity; the more varied the food, the better for the health of the animal. Frogs, lizards, beetles, snails, may occasionally be given. It easily kills a bird or a mammal much larger than itself.

Breeding.—No mongooses have ever bred inside a cage, but numbers of them (*H. anropunctatus*) annually breed in the garden, where they live in a state of semi-domestication. They breed in summer, and litters have been found to consist of from two to six young ones.

Transport.—These little creatures are so quarrelsome and pugnacious that they have often been observed to arrive in a mutilated condition when two or more specimens have been placed in a small cage. A deal box, 12 inches high and about 18 inches in length and breadth,

will comfortably accommodate a pair of mungoses. Even a male and female may fight unless they have been accustomed to live together for some time.

TREATMENT IN SICKNESS.

Diarrhoea and *dysentery* are the principal diseases which affect mungoses. No treatment could be adopted, as the animals refused nourishment.

OBSERVATIONS ON THE HABITS OF MUNGOSES.

Considering their size, they are very ferocious. When taken young, they, however, become wonderfully tame and attached to their owner. Adult animals seldom become tame enough, even for exhibition in a menagerie: they either remain hidden away in the straw or snap at the wire, uttering a querulous yelp, possibly expressive of disgust at the approach of a man. They have been known to refuse nourishment and to starve to death.

Of the two species above mentioned, an adult common Indian mungoose is, perhaps, the least tameable. When they once become accustomed to the new surroundings, their sullenness gives place to sociability, and they behave as if they were the most affectionate of creatures. They growl like tigers when eating. Although not addicted to climbing trees in their wild state, mungoses in captivity have been observed to take pleasure in climbing dead branches of trees inside the cages.

(78) THE MALAYAN MUNGOOSE.

(*HERPESTES BRACHYURUS*—*Gray.*)

Description.—General colour dark blackish brown, finely punctulated with yellow; head rather massive.

Hab.—Borneo and Malacca.

This animal has been recently acquired; it does not appear to carry its body low like the other Mungoose.

(79) THE CRAB-EATING MUNGOOSE.

(*HERPESTES URVA*—(*Hodgs.*))

Description.—It looks more like a small badger than a mungoose. Head and body about 18 to 21 inches, tail about 11. Fur long, coarse and ragged; under-fur soft and woolly. Colour of the body varies much in different specimens, generally dusky iron-grey, sometimes, as in the case of one exhibited in the garden, whitish. A white stripe runs along each side of the neck from the angle of the mouth to the shoulder. Head much darker, almost black, and speckled with white; the lower limbs black.

Hab.—It occurs in the South-Eastern Himalayas at low elevations, Assam, Arracan, Pegu, Tenasserim, and Southern China. A specimen said to have been captured at Julpigori was obtained in 1880.

LENGTH OF LIFE IN CAPTIVITY.

The maximum period during which a crab-eating mungoose lived in the garden has been only about eighteen months.

TREATMENT IN HEALTH.

Housing.—As it is semi-aquatic in its habits, the crab-eating mongoose should be accommodated in a place where it can have easy access to water. Its accommodation therefore may be provided in the form of a pit about 3 feet deep, with a bath, a grotto, and a grass or gravel promenade, the top being covered over with stout wire netting, or it may be a cage, detached or built in connection with others, with a bath and a grotto, or a box which serves the same purpose.

Food.—It is almost omnivorous; eats crabs, frogs, prawns, small fish, minced meat, &c.

Transport.—Besides the vessel for drinking water, another made of zinc or iron should be given, and clean water put in during the middle of the day when it is warm. If the journey or voyage is to last for some time, the animal should be fed for a few days prior to its departure upon such food as may be easily available during transport.

TREATMENT IN SICKNESS.

Nothing particular is known about the diseases to which this animal is liable.

OBSERVATIONS ON ITS HABITS.

The Crab-eating mongoose is a restless, active creature, walking about in its cage with heavy steps, and occasionally uttering a hoarse subdued cry. Those exhibited in the garden had no bath in their cage, but the animals could be often observed satisfying their aquatic predilections by immersing a portion of their bodies in the *gamla* which was provided as a substitute for a bath.

(80) THE BANDED ICHNEUMON.

(CROSSARCHUS FASCIATUS—*Desm.*)

Description.—Resembles a common mongoose, but stouter in build. Colour ashy grey, washed with brownish red on the back; fur rather harsh; about the neck and shoulders the hair is tipped white: brownish black bands across the posterior half of the back.

Hab.—South-East Africa.

LENGTH OF LIFE IN CAPTIVITY.

A specimen obtained in 1886 is still alive and well.

TREATMENT IN HEALTH.

With regard to *housing* and *feeding*, &c., this species may be treated like the other mongooses. The animal now living appears to thrive well in a small cage about 4 feet high and 10 feet in circumference, with a conical roof made of light planks lined with zinc; inside the cage is a small sleeping-box and a platform. During the winter canvas screens are let down at night. One of these animals developed a strong partiality for a bread diet.

HABITS.

Like other mungoses, it is rather heavy in its movements, and as inquisitive and active as the rest of the species. It may be often heard to utter the grating sound, like a mew, characteristic of the mungoses.

(81) THE STRIPED HYÆNA.

(HYÆNA STRIATA—Zimm.)

Hindi—*Lakar Bagha*, *Hondar*.

The hyæna is a well-known animal in Lower Bengal: no description is therefore necessary. The characteristic features of this animal are its short hind limbs, and the long hairy crest along the middle line of the back.

Hab.—Common in Central and North-Western India, extending through South-Western Asia to Northern Africa. Though not so common as in Western and Central India, it is not rare in Lower Bengal.

LENGTH OF LIFE IN CAPTIVITY.

A specimen has been living in the garden since 1879. Hyænas appear to be very hardy animals and bear captivity well.

TREATMENT IN HEALTH.

Housing.—Hyænas being extremely quarrelsome animals, difficulty is sometimes experienced in finding accommodation for them. On several occasions they have been known to mutilate, through the bars, a leopard or a wolf living in an adjoining cage, in spite of the stout wire-netting attached to the gratings which separate the compartments. It is safer, therefore, to have the partitions boarded up with thin planks. It is undesirable to keep a number of adult hyænas together; unless the floor is hard they burrow deep holes in it.

Food.—In their wild state they generally feed upon carcasses of animals that have been killed by others or that have died of diseases, and in captivity also they do not object to eat food which other animals will not touch; it is, however, better to feed them on fresh and wholesome food, regard being had to the artificial conditions of life in confinement. Bones are indispensable to them; they break and crunch up large pieces with surprising ease.

Transport.—As they are much addicted to biting destructible materials, a light iron cage should invariably be provided for their transport, unless the habit and temper of the animal to be transported is well known. A case is on record in which an adult hyæna, sent by rail from a station in West Bengal, escaped during the course of the transit by biting through the sâl wood battens of its cage; it was found, on the arrival of the train at the Howrah terminus, comfortably seated behind some bales of goods.

TREATMENT IN SICKNESS.

Hyænas have been known to die from *inflammation* of the stomach. Some six years ago a female hyæna suffered from extensive *ulceration* of the mucous membrane of its mouth, extending to the lips; the animal could hardly eat anything for about ten days, and was

extremely irritable. Taking advantage of its temper, nitrate of silver lotion was applied to the ulcer: a small mop fastened to the end of an iron rod was dipped in the lotion and held out to the animal, which seized it at once by the mouth. The repetition of this operation evidently gave relief to the beast, as it allowed itself, after a day or two, to be doctored without difficulty.

Wounds and injuries are very common amongst them: not long ago a specimen was so severely attacked by its companion in the same den that it had to be killed. Young animals, recent arrivals at the garden, sometimes die without apparently suffering from any illness.

OBSERVATIONS ON THE HABITS OF *HYÆNAS*.

Although nocturnal in habits in their wild state, they may be constantly seen restlessly pacing their cage almost the whole day, especially those that have for some time lived in captivity. Their mischievous propensities, however, seem to be aroused at night only. A hyæna is a very cowardly animal, so that the upraised broomstick of the keeper drives it to the furthest corner of the cage with its tail between its legs. They are sometimes very noisy at night, and their cry is harsh and disagreeable. With regard to their cowardice, it may be remarked that, if required to do so, a plucky keeper has no difficulty in going inside the den of an adult beast; it snarls, but shows no fight.

(82) THE WOLF.

(*CANIS LUPUS*—*Linn.*)

A black variety of the wolf was exhibited in the garden for a few months, prior to its departure to the Zoological Society's Garden, London. It came from Thibet.

(83) THE INDIAN WOLF.

(*CANIS PALLIPES*—*Sykes.*)

Hindi—*Bheriya*. Bengali—*Nekreh*.

Wolves vary in colour; generally they are of an earthy-grey colour with a brownish or fulvous tinge; some are entirely rufous. In some the brownish tinge on the back is much mixed with black, whereas in others there is a total absence of black. Black colour on the back appears to be more common in older specimens. In very young specimens there is a milk-white spot on the chest, which disappears when the animal is about a month and a half old, giving place to a dark colour below the neck.

Hab.—The Indian Peninsula. With the exception of a single specimen from Purneah, most of the wolves have been received from Behar and West Bengal.

LENGTH OF LIFE IN CAPTIVITY.

A wolf has been living in the garden for the last eleven years.

TREATMENT IN HEALTH.

Housing.—Adult wolves require substantial accommodation: they have thriven when kept in a building of masonry structure somewhat of

the same style as that assigned for an orang, but smaller. They should have an inner sleeping room and an outer den provided respectively with a platform and a bath, the latter being particularly necessary during the hot weather. The walls should, in the case of wolves, be whitewashed, if practicable, oftner than for other animals, as this helps to keep down the offensive smell inseparable from their residence. Young wolves can be kept in wire cages with boarded floors or in small portable cages.

Food.—Beef, boiled or raw, according to taste. Like civets and mungoses, they also eat bread, biscuits, and plantains. Tame wolves may be fed exactly in the same way as dogs.

Transport.—No particular remarks are necessary.

TREATMENT IN SICKNESS.

Two tame adolescent wolves had an attack of *paralysis* of the whole body, brought on, it was conjectured, by *sunstroke*; as the animals were past recovery, they had to be killed. Another wolf suffered from a similar ailment, and after lingering for a few months died. In this case, however, sunstroke could not have been the cause, as the animal lived in a perfectly shady place. Young wolves generally succumb to *diarrhœa*. Something resembling *St. Vitus' dance* was observed in a specimen, but its nature was never ascertained; the animal recovered after some time.

OBSERVATIONS ON THE HABITS OF WOLVES.

Wolves when brought up as pets have been known to become as tame as dogs, showing all their playfulness and intelligence and answering to their names, coming up and receiving caresses. Whether quite adult wolves would remain as tame as when they were young is not known. Some of the wolves living in the garden appear to be very fond of paddling the water, especially during the hot weather, so that the floor of their den is seldom dry. They are extremely restless animals, and may often be seen, like the hyænas, rapidly pacing up and down their cages. Their excitement and impatience are very great at the approach of feeding-time. The wolves in the garden have not been known to bark in the same way as a pariah dog, but they sometimes make an attempt as it were, at barking, a subdued sort of a "bow-wow." They have, however, been known to howl a great deal, and add to the evening chorus of discordant sounds produced by the lion's roar, the cry of the jackal, and the plaintive note of the distant dingo.

For further information on the habits of the Indian wolf the following works may be consulted:—"Fauna of British India"—Blanford; "Jungle Life"—Ball.

(84) THE JACKAL.

(CANIS AUREUS—Linn.)

The jackal is such a well-known animal in Bengal that any description is superfluous. Like wolves, jackals vary a great deal in colour. Quite adult and healthy specimens have a good deal of black

on the back and about the neck. Those brought up in captivity are generally pale coloured. Albino jackals have on several occasions been received. A jackal is subject to change of colour at different seasons of the year.

Hab.—India, Ceylon, Burmah, extending through South-West Asia to the Caucasus, and found in South-Eastern Europe in Greece and Turkey, and as far west as Dalmatia, also throughout; Northern Africa. Very common in Bengal, infesting jungles, thickets, and open countries, and found in hamlets as well as in popular cities like Calcutta. Jackals live in a wild state within the garden, and not unfrequently commit depredations amongst the deer and antelopes.

LENGTH OF LIFE IN CAPTIVITY.

A specimen obtained in 1876 is still alive.

TREATMENT IN HEALTH.

Housing.—Although jackals are cunning and mischievous animals, in captivity they have been generally found to behave well, and they can, therefore, be kept in stout wire cages, but the floor ought to be invariably made of planks or bricks, as they are somewhat addicted to burrowing.

Food.—Beef forms their ordinary food, but they eat fruits and bread as well, and thrive much better on a mixed diet than solely on meat.

Breeding.—Although jackals have never bred in captivity, they breed freely within the garden in a wild state. The number of young in a litter is from four to six, and during May and June a litter may be found in almost every drain of the garden and the adjacent grounds.

Nothing particular is known of their diseases in captivity.

HABITS OF A JACKAL.

The habits of jackals are well known and therefore very little need be said. They are shy and suspicious; at least they have never been known to become tame in this garden.

(85) THE BLACK-BACKED JACKAL.

(CANIS MESOMELAS—*Schreb.*)

More thick-set in build than the Indian jackal: saddle of the back broad; fur thick. Colour brownish grey; a good deal of black on the back. Changes of colour occur at different seasons of the year.

Hab.—South Africa.

(86) THE SIDE-STRIPED JACKAL.

(CANIS LATERALIS—*Sclater.*)

Description.—This animal is “distinguished from every described species of the genus by the black and white stripe extending along the flanks, and the very long black tail with a distinct white termination.”

Its general form is elongate and the snout pointed. The stripes and the general colour of the body are subject to change at different seasons of the year.

Hab.—West Africa. A specimen of this species was obtained from Zanzibar, but whether it was imported from the west coast or was procured in East Africa is not known.

LENGTH OF LIFE IN CAPTIVITY.

A black-backed jackal lived for about six years, and a side-striped species for about seven.

TREATMENT IN HEALTH.

Housing.—May be kept like an Indian jackal.

Food.—The same as an Indian jackal.

OBSERVATIONS ON THEIR HABITS.

Of the two, the side-striped jackal was tamer than the black-backed species; it was not unfrequently observed to wag its tail in recognition of kindness shown to it. It was as restless as the Indian or the black-backed jackal, but was not suspicious. Neither of the species was ever heard to cry. The stripes of the side-striped species and the black of the black-backed one altogether disappeared during the rainy seasons, appearing again in winter. They both liked dry places, and their invariable habit during the winter was to retire to bed early, perhaps to enjoy the warmth of the straw.

(87) THE DINGO.

(CANIS DINGO—*Blumenb.*)

Description.—It resembles the pariah dog of India in appearance. Ears erect, hairs about ears longish, tail slightly curved upward, with pendant hairs underneath it. Colour brownish-red throughout, except the chest and abdomen, where it is somewhat whitish.

Hab.—Australia.

LENGTH OF LIFE IN CAPTIVITY.

A specimen has been living since January 1882.

TREATMENT IN HEALTH.

Housing.—As the animal has rather active habits, its place ought to be large enough to enable it to run backwards and forwards, as it is wont to do; and, as its temper cannot be trusted, the cage ought to be divided into two compartments, so that it may be shut into one while the other is being cleaned. A sleeping-box, or more properly a kennel, should be provided. The specimen now living in the garden likes wallowing in water during the summer, and a large earthen vessel is sunk in the ground for the purpose.

Food.—Boiled beef is its ordinary diet, but it is occasionally allowed a roasted fowl or boiled mutton by way of change.

Transport.—As it is an easily excitable animal, it is better to transport it in a cage in which it has the least chance of being excited.

TREATMENT IN SICKNESS.

Whether such an animal is likely to die from *convulsions* is not known, but the *post-mortem* appearance of the companion of the present specimen suggested that belief. Unfortunately no autopsy was held.

OBSERVATIONS ON THE HABITS OF A DINGO.

The dingo appears to be an excitable animal, and very restless under ordinary circumstances. Though not savage, its temper can never be trusted. The specimen now in the garden allows the keeper to go inside the cage to clean it. It has a plaintive sort of cry, of somewhat prolonged note, and may often be heard at nightfall, particularly if there is a bright moon; it has never been heard to bark like a pariah dog.

(88) THE INDIAN WILD DOG.

(CYON DUKHUNENSIS—*Sykes*.)

Hindi—*Sona Kutta*, *Ram Kutta*. *Kuya* of the Sonthals, Kols and other aboriginal tribes of West Bengal.

Description.—The general form of this animal is like that of a jackal, but, though stout, it wants the compactness of the latter animal, and there is a certain ungainliness about it, owing to the distended appearance of its belly and abdomen, especially when one has lived in captivity for some time. The tail is thick. The colour of the animal varies somewhat, according to age, locality and season. It is generally rusty red, slightly mixed with black on the back. Specimens obtained from Western Bengal are generally paler than those from Assam, Tipperah, and Burmah; the winter coat is thick and bright coloured. Terminal portion of the tail black. The average dimensions of a wild dog are, head and body, about 37 inches; tail about 15.

Hab.—It occurs throughout the Himalayan forests from Kashmir to Assam, in the jungles and forests of Western Bengal, and is found in the larger forests of the Indian Peninsula, in Gilgit, Ladak and other parts of the Upper Indus Valley, and has also been obtained from Eastern Thibet.

Specimens have been sent to this garden from Burmah, Assam, Tipperah, Darjeeling, Hazaribagh, and Vizagapatam.

LENGTH OF LIFE IN CAPTIVITY.

No wild dog has as yet lived in the garden more than two years and a few months. For some reason they do not appear to thrive well in captivity.

TREATMENT IN HEALTH.

Housing.—The animal being of extremely active habits in its wild state, it ought to have a tolerably large cage, where it may take such

exercise as is possible. Wild dogs are not quarrelsome animals; two or more can, therefore, be kept together in the same cage.

Food.—The want of success in keeping wild dogs alive for more than two years has probably been due partly to the absence of exercise, and partly to the nature of the diet, which consisted chiefly of beef, raw or boiled. In their wild state they are accustomed to hunt and kill deer, antelopes, and wild pigs for food, which not only implies fresh food, but a considerable amount of exercise. The specimen now in the garden is fed upon fowls, rabbits, mutton, eggs, and occasionally beef. Endeavours are also being made to feed it upon bread, but as yet it has not taken kindly to this food.

Transport.—No particular directions are necessary, as it may be treated like one of the cats or larger civets.

TREATMENT IN SICKNESS.

Diarrhoea and skin disease have been observed in wild dogs. The diarrhoea was probably the result of unsuitable diet and want of exercise. In May 1889 a mangy-looking wild dog arrived from Darjeeling. On examination it was found to be suffering from extensive skin disease; part of its body was bare, the fur that remained was completely matted with the filth of the cage and the exudation of the skin. The animal, being in the last stage of exhaustion, was fed before being removed to a new and comfortable cage. When it had recovered from the nervousness caused by travel and new surroundings, it was washed with carbolic soap and tepid water, wiped dry and placed in a separate cage with a thick bedding of straw, and the whole body smeared with a solution of phenyle. Some difficulty was found in supporting its strength, as it would not eat properly. The next day the matted fur was cut off and the body smeared with sulphur and boracic ointment. Under this treatment the animal recovered in about a month and a half.

OBSERVATIONS ON THE HABITS OF A WILD DOG.

For a few days a pair of adult wild dogs were kept in a place with a mud floor; they at once set about digging holes in it, and made use of it, when finished, as a sleeping place, in spite of the presence of a deal-wood box which was given them for this purpose. A wild dog does not appear to be as shy as a jackal or a wolf: it will stand or sit quite close to the bars of its cage, and when sufficiently tame is somewhat demonstrative. In captivity it has not been heard to howl or cry, but sometimes one may be heard to utter a kind of squeaking sound. It does not appear to be fond of water.

(89) THE INDIAN FOX.

(*VULPES BENGALENSIS*—*Shaw.*)

Hindi—*Lomri*. Bengali—*Kheksial*.

This is such a well-known animal in Lower Bengal that any description would be superfluous.

Hab.—Throughout India, from the base of the Himalayas to Cape Comorin; not known to occur west of Sindh and the Punjab, nor east of Assam. It inhabits the open parts of the country. Not uncommon in the drains of the Calcutta maidan.

LENGTH OF LIFE IN CAPTIVITY.

The maximum period during which an Indian Fox has lived has not been more than five years.

TREATMENT IN HEALTH.

Housing.—New arrivals had better not be exposed for exhibition at once, as the presence of other animals and other causes of excitement sometimes frighten them so much that they may altogether refuse to eat and drink. In this garden they are usually kept in one of the cages of the Kuch Behar House. Either a hollow log of wood or a small box within the cage forms an excellent place of retirement for these animals. As some of them have been found to climb the wire partitions of their cage, care should be taken to have it lined with thin planks.

Food.—The usual diet of these animals in captivity consists of boiled meat, beef or mutton, eggs, and plantains. Some of them have been found to be extremely fond of jack-fruits. They have often been tried with rats, crabs and frogs, but in captivity they do not appear to care for such edibles.

Transport.—A small box, 2 feet long, 18 inches broad and about 15 to 18 inches high, will comfortably accommodate a pair of these animals. For a sea-voyage the arrangement ought to be somewhat special, so that a box, smaller than that mentioned above, placed within a wire cage, will answer very well.

TREATMENT IN SICKNESS.

With regard to their diseases nothing definite is known.

HABITS.

The habits of Indian foxes in captivity are uninteresting, as they spend much of their time inside their sleeping box. For particulars of their habits in a wild state, Blanford's Fauna of British India (Mammalia) may be consulted.

(90) THE COMMON FOX.

(*VULPES ALOPEX*—(Linn.))

Two varieties of the common fox have been exhibited in the garden—the *Vulpes Alopex*, var. *Montana* from the Western Himalayas, and the common fox from the British Islands. Both of them are much larger and more richly coloured than the Indian fox. Their prevailing colour varies from ruddy chestnut to dull rufous, but it is subject to much individual variation, especially in the Himalayan form. The Himalayan variety exhibited in the garden had scarcely any cross stripe on the shoulder, and differed from the European form in having

more black on the outside of the limbs. The summer coating of both the forms is very shabby; by the middle of March they shed most of their winter coat, the under fur becomes loose, and the animals look as if they had rolled on a heap of wool.

Hab.—The Himalayan form is found from Nepal to Kashmir and Gilgit. The European form is found throughout Northern Europe and the British Isles.

LENGTH OF LIFE IN CAPTIVITY.

The maximum period during which a common fox of Europe has lived in the garden has been over six years; that of the Himalayan variety has not exceeded four years.

TREATMENT IN HEALTH.

Housing.—The general principle that should be observed is to keep them in a cool airy place. In this garden they are generally exhibited in one of the cages of the Kuch Behar House (see page 56). During the warm summer days they should have cold water freely sprinkled over them with a garden syringe, and to reduce the temperature of the cage some wet straw or hay may also be put on its roof. From March to October is the most trying time for these animals in Lower Bengal.

Food.—Four to six plantains and a little bread between 8 and 9 o'clock in the morning; one to two pounds of boiled beef in the evening. The less beef is given during the hot weather, the better. Besides plantains, the foxes will eat dates, oranges, pears and various other fruits. Chickens and rabbits may occasionally be given as a change of diet.

TREATMENT IN SICKNESS.

These foxes have been known to die from *convulsions* and *excitement*.

HABITS.

English foxes become wonderfully tame. They wag their bushy tails, roll on the floor of the cage, and utter a subdued chattering moan expressive of recognition of a friendly visit. If a bit of bread or some fruit is given to a tame beast, it does not eat without some demonstration of pleasure. They pant much and otherwise feel uncomfortable during the summer. Both the English and the Himalayan foxes have been observed to turn paler after prolonged captivity.

(91) THE INDIAN MARTEN.

(*MUSTELA FLAVIGULA*—*Bodd.*)

Description.—It has a slender body, short limbs and a long tail. The colour of the head, face, nape, the rump, tail and the limbs glossy brownish black; the back and the flanks pale brown; the chin and

throat dirty white; breast and abdomen brownish yellow. The ears are small. In its movements it resembles an otter, and has, like that animal, an arched back. Two specimens, both said to have come from Bhutan, differed in colour; one being much paler than the other: head and body 20 to 22 inches; tail 16 inches.

Hab.—Throughout the Himalayas from the west of Kashmir to the eastern extremity of Assam; also throughout the hilly parts of Burmah, the Malayan peninsula, and Sumatra. By some authorities it is said to be found in Southern China and even in Amurland. In Southern India it is found on the Nilgiri hills, on the Travancore ranges, and in other portions of the country.

LENGTH OF LIFE IN CAPTIVITY.

No specimen has lived for more than a year.

TREATMENT IN HEALTH.

Housing.—Both the specimens exhibited were kept like civets and other smaller carnivorous animals in the Kuch Behar House. The want of success in keeping them alive for a longer period had evidently nothing to do with their accommodation.

Food.—Boiled beef, eggs, and plantains.

TREATMENT IN SICKNESS.

Both the specimens died rather suddenly, and as no autopsy was held, nothing can be said with regard to their diseases.

HABITS.

Very restless, active animals, perfectly diurnal and rather sociable in habits.

(92) THE WEASEL.

(*PUTORIUS VULGARIS*—(*Gmel.*))

Description.—Slender and elongated in form. Its prevailing colour is whitish brown, tip of the tail dark. Winter coat almost white.

Hab.—Northern Europe, Northern Asia.

A specimen lived for about three years in the garden.

(93) THE YELLOW-BELLIED WEASEL.

(*PUTORIUS CATHIA*—*Hodgs.*)

Description.—A very small animal, measuring, head and body, about 9 to 10 inches, tail without hair 5 to 6 inches, and with hair from 6 to 7 inches. Colour of the back, face and upper surface of head dark brown; the limbs and tail are of the same colour, but slightly paler. Chin, upper lip and throat generally white; chest, abdomen and inside the limbs yellowish or brownish yellow. In the specimen exhibited the yellow became very pale after the animal had been a year in captivity.

Hab.—Himalayas. The specimen obtained for the garden was captured near Darjeeling at an elevation of nearly 7,500 feet.

LENGTH OF LIFE IN CAPTIVITY.

About eighteen months in this garden.

TREATMENT IN HEALTH.

Housing.—As it is an animal of small size and cleanly habits, it is much better to keep it by itself in a small cage.

Food.—The specimen exhibited in this garden was fed on sparrows, eggs, minced meat, grasshoppers, and bread and milk. Ordinarily it had about two ounces of milk and a little bread in the morning, and either an egg, or a sparrow, and a small quantity of minced meat in the evening. Rats were occasionally given, and it killed them with great ferocity.

TREATMENT IN SICKNESS.

This animal died from the effect of an *abscess* in its throat, which did not admit of treatment.

HABITS.

It is an extremely active, inquisitive and blood-thirsty little animal. To try its strength guinea pigs were occasionally put in its cage, and it killed them with wonderful ease and rapidity. It was otherwise a sociable beast; it twice escaped from its cage and did not stray far, but amused itself by hunting squirrels.

(94) THE TAYRA.

(*GALICTIS BARBARA*—(Linn.))

Larger in size than the Indian marten; prevailing colour brownish black, a large yellowish white patch on the throat.

Hab.—Tropical America.

A specimen lived for about two years in the garden. This animal had a remarkably heavy footfall.

(95) THE INDIAN RATEL.

(*MELLIVORA INDICA*—Kerr.)

Hindi—*Biju*, *Bajar-bhal*.

Description.—This animal has a stout body and short limbs. External ear almost wanting. The coloration is very well marked. It is greyish white above, including the upper surface of the tail; lower parts, including the limbs, black; face, the under surface of the tail and its extremity also, black. A full-grown animal measures, head and body, about 32 inches, and tail with hair about 6.

Hab.—Found in India generally from the base of the Himalayas. Specimens have been obtained from Hazaribagh (West Bengal), Orissa, Oudh, Behar, and the Central Provinces.

LENGTH OF LIFE IN CAPTIVITY.

Indian Ratels are hardy animals. A specimen obtained in 1876 lived till 1886, in which year it was sent away in exchange.

TREATMENT IN HEALTH.

Housing.—As the animal is much addicted to destroying materials, it should be provided with a strong cage. One of them has been known to break through the stout wire netting with which some of the cages of the Kuch Behar House are built. It should not be placed in a conspicuous part of a zoological garden, owing to the highly offensive smell attaching to it. It is, moreover, a dirty animal. The specimen that lived so long in the garden was kept in a circular cage about 8 feet in diameter and 6 feet high. There was a sleeping-box placed on the top and a stout branch of a tree fixed in the centre. Besides drinking-water in a small iron vessel, there was a heavy stone trough full of water which it often used as a bath.

Food.—Its usual food consisted of boiled beef and some bread, but it ate almost anything; fish, rats, crabs, frogs, eggs, entrails of chickens were always acceptable to it; it also relished boiled rice, milk and plantains.

Transport.—Care should be taken to provide an iron cage, as it bites through wood in a short time.

TREATMENT IN SICKNESS.

The animal of which mention has been made was observed to suffer from *diarrhœa* brought on by indigestion. The usual remedy in such cases was to starve it.

OBSERVATIONS ON THE HABITS OF AN INDIAN RATEL.

Although nocturnal in its habits in a wild state, it has been observed to be wideawake during the day in captivity. The specimens that lived in this garden were seldom found to be inactive: they would either pace their cage or would be occupied in scratching or digging up something. Though very active, they are heavy in their walk. From the observations taken of these animals, they do not appear to be altogether untameable. One of them had a special fancy for unfastening a particular iron bar as often as it was fixed in its proper place. It cleverly managed this by its sharp hooklike claws, and repeated the act if, instead of the iron bar, a walking-stick or anything else was substituted in the same place.

(96) THE HOG-BADGER.

(*ARCTONYX COLLARIS*—*F. Cuv.*)

Hindi—*Bhalu-sûar* or *Balu-sûr*.

Description.—Stout in form, with short limbs and long truncated snout, resembling that of a pig. Ears short. The prevailing colour of the body and limbs is grey, but it varies considerably in individual specimens, and also, it appears, according to age and length of life in

captivity. A very dark example has been known to become whitish grey after having been nearly four years in the garden : generally there is more black on the back and part of the sides. The head is white, a black band encircles the eyes and ears, and is formed by a stripe which, commencing from the upper lip, passes over the eye and ear, and by another from the chin which runs backwards across the chin to the ear. These marks also vary. Throat, sides of the neck, and the tail whitish, lower parts and limbs dusky, washed with pale yellow or orange. The head and body of a full-grown animal measure about 30 inches, tail about 11 inches.

Hab.—Nepal, Sikkim, Assam, Sylhet, Cachar, Arracan, Pegu, and Tenasserim ; has been also obtained from Western Yunan. Specimens have been received from Darjeeling, Assam, Julpigori, Tipperah, and Chittagong.

LENGTH OF LIFE IN CAPTIVITY.

The longest period during which a hog-badger has as yet lived has been only about six years.

TREATMENT IN HEALTH.

Housing.—Its proneness to escape has been found to be great, unless secured in a strong cage. The accommodation that has answered very well for this beast consists of an iron cage, some 12 feet long, 5 feet broad, and 4 feet high, resting on a brick-on-edge platform. On one end of the platform is a small deep tank, filled with mud and sand, into which the animal can burrow at pleasure ; besides, there is a small box, inside which the animal remains during the greater part of the day ; during the winter a quantity of straw is given. A neat little tiled shed shelters the cage and its inmate from sun and rain. The floor of the cage for a hog-badger should be hard and well-built, as the animal is much addicted to burrowing and clawing. Shower-baths should be administered to it almost every day by a garden syringe during the extreme hot weather.

Food.—The ordinary diet of a hog-badger consists of a pound or two of boiled meat in the evening ; a few plantains or other fruits and some bread are also frequently given them in the morning. They are said to be particularly fond of earthworms, but this has not been observed to be the case with the animals living here. On the other hand they have been known to eat fresh-water and land snails with avidity.

Transport.—The remarks which have been made with respect to the transport of a ratel apply to these animals also—that is, the cage in which it is intended to convey them should be strong. Care should also be taken not to expose them much in the sun. An occasional bath is beneficial.

TREATMENT IN SICKNESS.

Besides a tendency to fatness on their part—probably owing to absolute want of exercise—nothing is known with regard to their diseases.

OBSERVATIONS ON THE HABITS OF A HOG-BADGER.

It is thoroughly nocturnal in habits, sleeping the greater part of the day; when disturbed it becomes enraged and either darts at the disturber with a hissing grunt, or retires further into the hole or box. Its anxiety to escape has been already alluded to. Once a somewhat tame animal was kept in an iron enclosure about 8 feet high; after having been in this place for nearly a fortnight the animal disappeared one night. To accomplish this it had not only to climb the fencing of its enclosure, but a wall of equal height, the coping of which was studded with broken glass. Another animal effected its escape by breaking open the roof of its cage.

(97) THE COMMON OTTER.

(LUTRA VULGARIS—*Eral.*)

Hindi—*Ud*. Bengali—*Ud-biddal*; *Manch-bhondor*, that is, fish-otter.

(98) THE SMOOTH INDIAN OTTER.

(LUTRA ELLIOTI—*Anderson.*)

It is called *Ludhra* in Sindh.

Otters are so common in Bengal that no description is needed.

These two species (97 and 98) have a great resemblance externally; if, however, they are carefully observed side by side, it will easily be seen that a full-grown common otter is a slightly larger animal than the next species, and that the upper edge of its naked muzzle or the pad of the nose is not straight, but somewhat raised in the middle and concave on each side, whereas the pad of the nose of the smooth-haired species is almost flat.

Hab.—The Indian form of the common otter is found almost all over India and Ceylon, and is frequently met with in the neighbourhood of Calcutta. They have been obtained from Rajshahye, the Sunderbuns, Jessore, Rungpore, Midnapore, Bhagulpore, the Sonthal Pergunnahs, Purneah, and Dacca. The smooth-haired species occurs throughout India: common in Sindh and the Punjab, and found side by side with the common otter in Lower Bengal. This species has been received from Sindh and the Punjab.

LENGTH OF LIFE IN CAPTIVITY.

A specimen of the common otter has been living in the garden since October 1886. Otters have lived for periods varying from a few months to five years. A smooth-haired species lived from March 1876 to August 1887; another specimen from Bhawlpore (Punjab) has been living since January 1889.

TREATMENT IN CAPTIVITY.

Housing.—Water is indispensable for the health and comfort of an otter. The style of accommodation that has been found best suited to their habits in this climate consists of an iron structure built on the

slope of a tank and enclosing a large area of water. The enclosure may be 30 feet long and 15 feet broad, stretching lengthwise into the tank, and built on substantial brick walls with somewhat deep foundation, as otherwise the otter is not unlikely to work its way out under the mud. The portion of the enclosure which is to remain under water should be made of at least half inch thick iron rods, placed one inch or an inch and a half apart from each other; the portion above the water may be made of quarter inch rods, placed at an interval of an inch and a half. Stout wire netting may be used for the roof, which, during the hot weather, should be covered with a slight thatching of straw. If some extent of dry ground is not available inside the enclosure, a wooden platform may be built and a sleeping box provided. For reasons to be explained later on, otters in this garden are sometimes kept in other and less comfortable places. Otters, unknown to each other, should never be placed together.

Food.—Their food consists principally of fish. Otters eat much, but waste more, if they have an opportunity of doing so. Two pounds of *koi* or *singi* fish form the usual allowance of a full-grown otter, but their appetite varies. Besides fish they eat crabs and frogs, and tame ones have been known to become very fond of bread and biscuits. An otter is therefore an expensive animal to keep, a full-grown one costing from Rs. 6 to Rs. 8 a month. As far as possible young otters should not be fed on *koi* or *singi*, but on less bony fish.

Transport.—To transport an otter is by no means easy, especially if it is to be sent by sea and the distance is long; the difficulty lies in providing fresh fish. Fortunately, however, the *koi* and *singi* fish are hardy, and with a little care may be kept alive for a considerable time. It is best to put these fish in an old earthen jar, but this may be fractured on board a steamer; so the next best plan is to put them in a wooden tub (half of a beer barrel) with plenty of tank weeds and mud; a tub will hold from 10 to 20 pounds of fish; it should be covered over with a piece of fishermen's net, otherwise the fish will escape; in such an arrangement the water need not be changed more than once a fortnight. Crabs may also be sent, and otters may be fed on eggs and chickens; but as they do not all care for such food, it is better to observe them and train them to eat such things before despatch. The cage for transport should be made with a sliding partition, so as to divide it at the time of cleaning into two compartments, otherwise it will soon become very dirty and the animal will suffer. A quantity of dry earth or sand should be provided to enable the animal to roll over it, and the creature should be syringed or sprinkled with water twice a day. On approaching cold latitudes both the otter and the food—the fish when provided—should be placed somewhere near the engine room.

Breeding.—Otters have never bred in this garden.

TREATMENT IN SICKNESS.

Young otters, and sometimes adult ones also, have been known to pine away and die. On one occasion a tame smooth-haired otter suffered from an *abscess* in the throat; this was opened and the animal recovered without any further treatment. Those kept in places with

brick-on-edge or cemented floor sometimes suffer from a kind of *foot disease*, no doubt brought on by constantly walking on the hard stone floor.

OBSERVATIONS ON THE HABITS OF OTTERS.

Otters are extremely active, inquisitive and noisy animals. Although in their wild state they are to a great extent nocturnal in habits, in captivity they are lively during the greater part of the day. They sleep during the day just as any other diurnal animal does. Although otters are amiable creatures in appearance and extremely graceful in their movements, they are sometimes very pugnacious and combative. When one is allowed to remain for some time by itself, it becomes very exclusive in its ideas, and strongly objects to the intrusion of strangers. Attempts to accustom two or three of them to live together have several times failed. It was thought that if one were introduced in a cage it would be protected, and the older inmate of the premises would get accustomed to its presence. No sooner, however, was this plan tried than the cage with the new otter inside it was dragged by the old one into the water and held under as if to drown the poor creature. Hence difficulties arise in housing otters, and often they have to be kept in places not particularly suited to their habits. Towards feeding-time otters become very impatient and restless, and may often be seen rapidly pacing up and down the cage, and every now and then standing up in front of the door anxiously looking forward to the direction from which their food is brought, and uttering shrill cries. As the familiar figure of the keeper approaches with a bucketful of fish, the otter becomes still more restless and impatient, cries louder and incessantly; as the man reaches the door, the otter jumps into the water and dives after each fish as thrown in. It brings up the fish in its mouth and commences eating it from the head. Though extremely fond of fish and mostly living upon them, otters have been observed to eat crabs and small tarrapins with evident relish. Two tame otters, having once escaped from an unfinished cage in which they were placed on arrival, were allowed the freedom of the lake for a day or two, when, having caught and eaten fish to their hearts' content, they would divert themselves with extracting crabs and eating them. An otter has also been found eating a bird. A number of whistling teals had at one time been placed in the otter enclosure as an experiment. For the first day or two nothing particular happened; early on the morning of the third day one of the teals was missed, but no suspicion fell upon the otter until on the morning of the fourth day it was found in the act of eating one. The remaining birds were, of course, removed to a safer place.

There is an anecdote on record of an otter making friends with a crocodile. Peggy, the oldest otter then living in the garden, once managed to escape by digging a hole in one corner of the cage where the bars rested on the mud. The operation having been performed under water, it passed unnoticed till after the escape of the animal. Having gained its freedom it took to amusing itself in the water, and baffled all attempts of the keepers to recapture it, a large island overgrown with shrubs and undergrowth giving it a great advantage over its pursuers. Night supervening, the pursuit had to be abandoned

temporarily. Next morning the animal was seen disporting itself close to the island, but on the approach of the men it disappeared until, after considerable search, it was found hidden inside a burrow. Its bewildered appearance betrayed something unusual which was not properly understood till after the capture of the beast, when it was discovered that all the time it had been keeping company with a crocodile in its hiding place. That it ever escaped being devoured was a wonder. The crocodile was killed. A common otter twice escaped, and on each occasion it made for the nearest fish-market.

(99) THE CLAWLESS OTTER.

(LUTRA LEPTONYX—*Horsf.*)

The chief characteristics of this otter are that its claws are extremely small and rudimentary, and in some specimens altogether wanting, and that the third and fourth toes on all feet are considerably longer than the others: the skull also of this species is much smaller than in other forms found in India.

Hab.—Inhabits the greater part of the Oriental region. It occurs in the Himalayas at low elevations, and is found in Bengal, Assam, Burmah, Southern China, the Malayan peninsula, and Java. Except at high elevations on the Nilgiri and some other places, it does not occur in the Peninsula of India.

LENGTH OF LIFE IN CAPTIVITY.

The longest period during which one has lived in the garden has not exceeded three years.

With regard to *housing, feeding, transport, &c.*, it may be treated like other species mentioned above.

OBSERVATIONS ON ITS HABITS.

As far as they have been observed, the clawless otters are certainly tamer than the other specimens, but not less noisy.

(100) THE RACON DOG.

(NYCTEREUTES PROCYONOIDES—*Gray.*)

Description.—Total length, including the tail, about 25 inches; general colour greyish brown, with black tips to the hair; cheek and legs dark chocolate brown; tail short, thick and pale brown with white tips to the hair.

Hab.—Japan and Amurland.

LENGTH OF LIFE IN CAPTIVITY.

A specimen lived about eighteen months. Animals from such a climate as that of Amurland are not likely, even under the most favourable circumstances, to thrive in Lower Bengal.

TREATMENT IN HEALTH.

Housing.—The only chance of keeping such an animal alive is to place it in a very cool and airy place, and completely sheltered from the sun. With respect to the specimen exhibited in the garden, wet *khus-khus* screens, hung outside the cage, were found useful in lowering the temperature of the place during the middle of the day in summer when the animal panted a good deal: a shower-bath administered with a garden syringe was also beneficial. The best treatment, however, is to allow it, when practicable, as much liberty as possible.

Food.—Eggs, bread, milk, fruits, small birds and meat. The animal referred to above lived chiefly upon eggs and bread and milk.

TREATMENT IN SICKNESS.

The animal spoken of here suffered from an obstinate kind of *skin disease* which baffled all treatment. After its death an autopsy was held and its liver was found to be extremely enlarged, and almost all the viscera enveloped in masses of fat.

OBSERVATIONS ON THE HABITS OF A RACCOON DOG.

This animal was very shy on arrival, but after some time in captivity it became so tame as to respond to caresses and attention. It appeared to be very lazy, probably owing to the enervating influence of the climate: it was never known to eat before the evening was somewhat dark. Although generally silent, it had a soft mew, distinctly expressive of pleasure.

(101) THE WHITE-NOSED COATI.

(NASUA NARICA—(Linn.))

Description.—Stout and rounded in form. The chief characteristics of this animal are its elongated and tapering head, truncated nose and long and hairy tail. The colour of the fur blackish brown above, yellowish beneath; a good deal of grey about the head; tail yellowish black and ringed indistinctly.

Hab.—South America.

(102) THE RING-TAILED COATI.

(NASUA RUFA—(Desm.))

Description.—It is uniformly fulvous in colour, tail distinctly ringed.

Hab.—South America.

LENGTH OF LIFE IN CAPTIVITY.

A white-nosed coati lived for about five years, and the longest period during which a ring-tailed coati has as yet lived has been only a little over four years.

TREATMENT IN HEALTH.

Housing.—Coatis are hardy animals, requiring no special treatment with regard to their housing; as they are rather destructive animals, the cage needs to be strong. When kept in one of a series of cages in a row, they have been known to bite other animals through the wire or grated partition, whenever they had a chance; the partition separating them from other animals should therefore be lined with thin planks or stout wire of a small mesh. A small block of wood or a piece of stone should be given them for scratching their claws on.

Food.—Boiled beef forms their ordinary diet in captivity, but they eat fruits, eggs, small birds, land and fresh-water snails, frogs, lizards and beetles; they are in fact omnivorous.

TREATMENT IN SICKNESS.

These animals have been known to suffer from *diarrhœa* and *dysentery* which yield to change of diet.

OBSERVATIONS ON THE HABITS OF A COATI.

Coatis are restless, inquisitive animals, poking their long truncated noses into everything; their footfall is heavy, and their cry is harsh and grating, but very subdued. They are bold animals, and although not ferocious, their temper can never be trusted.

(103) THE KINKAJOU.

(CERCOLEPTES CAUDIVOLVULUS—(Pall.))

Description.—General colour maroon brown; nose short, acuminate; ear oblong; tail elongate, hairy and prehensile. It is about the size of a cat, but slender.

Hab.—South and Central America.

LENGTH OF LIFE IN CAPTIVITY.

The maximum period during which a specimen has lived in the garden has been only a little over three years.

TREATMENT IN HEALTH.

Housing.—As the animal is fond of climbing trees it should have a place assigned to it where it can indulge in its favourite habits, and for this purpose the cage ought to be somewhat high, with dry branches of trees stuck inside it. A wire cage, some 8 or 10 feet long, 6 feet broad and 7 or 8 feet high, with a shelf and a box near the roof as a retiring place, may answer very well. The cage may be either isolated or in connection with any other structure.

Food.—Small birds, eggs, bread, milk and insects (the animal that was exhibited in the garden had no liking for the latter).

TREATMENT IN SICKNESS.

Nothing particular is known in respect to their ailments in captivity.

OBSERVATIONS ON THE HABITS OF A KINKAJOU.

The single specimen, exhibited in the garden, slept much during the day, but was generally active at the approach of night. It was very tame, and never showed any inclination to stray when let out of a morning. Its movements on the ground were rather awkward, but it was an expert climber. When enraged it drew back and hissed, and was very quick in striking with its forepaws.

(104) THE PANDA OR CAT-BEAR.

(ÆLURUS FULGENS, *F. Cuv.*)

Description.—About the size of a large cat, the head round, and the face short and very broad; limbs short and stout, tail long and thick: very prettily coloured, being yellowish red on the back, head and tail, the latter ringed and black tipped: the upper limbs and the lower parts of the sides generally much darker than the back; abdomen brownish. Face and lower lips white: a stripe of dark brown or red runs down from above the eye to the corner of the mouth; it may be indistinct or altogether wanting. Ears white inside and at the margin outside, rest of the outside black. Feet and the pads covered with hair, which become thin and worn-out in captivity. The dimensions of a full-grown cat-bear are about 24 inches, tail 17.

Hab.—South-Eastern Himalayas at elevations from 7,000 to 8,000 feet. As far as known its western limit is Nepal, but the eastern limit extends through the mountain ranges north of Assam to Yunnan, where, in the higher mountain ranges to the east, it has, according to Anderson (Anatomical and Zoological Researches), a greater numerical development than in the Himalayas.

LENGTH OF LIFE IN CAPTIVITY.

The maximum period of a cat-bear's life in the garden has been only about twenty months. Considering the elevation at which these animals live, it is not expected that they should thrive longer in Lower Bengal.

TREATMENT IN HEALTH.

Housing.—The only efficient method of keeping a cat-bear alive and in health in a climate so strange to it as that of Calcutta, is to allow it as much liberty as possible, by which means the animal is enabled not only to take plenty of exercise, but to find much of its own food also, and, as it is easily tamed, this can be accomplished without much difficulty. The best plan is to locate a new arrival in a large airy cage under the shade of a tree, or better still under a bamboo clump. Here it should be fed and attended until it becomes thoroughly accustomed to

its new surroundings, and begins to look out for food at the appointed hours; it should then be gradually encouraged to come out and climb the tree or the bamboo clump, taking care always to shut it in before darkness comes on. The animal will soon learn to come down of its own accord at the proper time.

There is some drawback to this method of keeping animals in a place much frequented by visitors, and the spot selected should therefore be as retired as possible. Another method suggested is to tie it up to a beer barrel with a chain and allow it to roam about; this has never been tried.

Food.—It eats plantains, dates, bread, milk, bamboo leaves and sprouts, grass, eggs, and small birds, such as sparrows. The specimen that lived in the garden for about twenty months fed mostly upon bread and milk, and as it almost invariably passed the day in a bamboo clump, it consumed a good deal of its leaves and sprouts.

Transport.—A cat-bear is an extremely delicate animal and cannot endure heat; it should not, therefore, be brought down from the hills except during the winter, even for the purpose of sending it away to some other congenial climate. Its journey in the plains should be so arranged as to be performed by night and early morning. A light cage with bamboo or round wooden sticks on all sides should be provided; a plank box will suffocate it. For a sea voyage it may be placed in the ice-house of the steamer while passing the warmer latitudes.

TREATMENT IN SICKNESS.

Cat-bears have been known to die from *convulsions*.

OBSERVATIONS ON THE HABITS OF A CAT-BEAR.

In captivity a cat-bear is placid and inoffensive, and becomes within a short time tame and docile. Its movements are awkward and slow on the ground, but it is an excellent climber. One of the specimens that lived in the garden has sometimes been observed to sleep on the bamboo clump in the angle formed by the crossing of bamboos. This animal held its food—bread, plantains, or even eggs—in its fore-paws. It was never observed to drink milk by inserting its lips, but always by lapping very gently and quietly. In captivity it is generally a very silent animal; but when angry or otherwise irritated it utters a “sharp spitting hiss.”

For further particulars on the habits of cat-bears the following books may be consulted:—Mammals of India—Jerdon; Fauna of British India—Blanford; Proceedings, Zoological Society, London, 1870, “on the habits of cat-bears,” by Bartlett.

(105) THE POLAR BEAR.

(*URSUS MARITIMUS*—*Linn.*)

It is distinguished from all other species by its perfectly white colour.

Hab.—Polar regions.

LENGTH OF LIFE IN CAPTIVITY.

A specimen lived from March 1886 to November 1887.

TREATMENT IN HEALTH.

Housing.—A polar bear is one of those animals which should never be acquired for exhibition in this climate. The animal here referred to was merely deposited by a dealer who had sent it to this country for sale, and every device that could possibly be adopted to mitigate its sufferings was tried. It was placed in one of the coolest dens of the Carnivora House, and a bath was especially built for its comfort. During the hot weather fifteen seers of ice were daily given, which it enjoyed very much, often crouching upon a large block, or otherwise making the best use of it.

Food.—Its food consisted of milk, bread and biscuits in the morning and about three pounds of fat mutton in the evening. Fish and live pigeons were also occasionally given.

Transport.—Any remark on this head is perhaps unnecessary.

TREATMENT IN SICKNESS.

This animal after having been about a month in the garden became subject to rather extensive *superficial ulceration* of the fore parts of its body, involving the ears and upper front limbs. This originated in a slight abrasion which it inflicted upon itself while rubbing its shoulder and ear on a large piece of wood. So rapid was the progress of the disease, that within three days the whole front part of the body became one mass of superficial ulcer. While being treated for the ulcer, the right ear suppurated and became full of maggots. Fortunately everything soon yielded to the persistent use of a weak solution of corrosive sublimate.

OBSERVATIONS ON ITS HABITS.

This animal had a peculiar habit of constantly sliding backwards on the smooth wet floor of its den—some relic probably of its way in icy regions.

(106) THE BROWN BEAR.

(*URSUS ARCTOS*—*Linn.*)

Hindi—*Barf-ka-rinch.*

Both the European and the Himalayan forms of brown bear have been exhibited in the garden. The only difference that has been observed is that of size, the Himalayan form being smaller than the European variety; the former is also lighter in colour than the latter, but the shades of colour vary a great deal in both. The fur of the European variety appears to be much more shaggy than in the Himalayan bear. Both have longish fur on the shoulder, forming a bushy tuft and giving the appearance of a hump.

Hab.—The brown bear has a wide range of distribution, being met with throughout the greater portion of the Palæarctic region. In Europe it is found in Norway, Sweden, Russia, Siberia, Poland, the Pyrenees, and Northern Europe generally; in temperate Asia it is found in Northern Siberia, Kamtschatka, Amurland, and the Himalayas. The Himalayan form extends from Afghanistan as far east as Nepal, and is common in the Astor Valley and the Gilgit district. Specimens have been obtained from Kashmir and Kumaon.

LENGTH OF LIFE IN CAPTIVITY.

A pair of the European variety have been living since December 1887, and a pair of Himalayan brown bears from March 1884; the former lived for a number of years in the menagerie of the late King of Oudh before their arrival here.

TREATMENT IN HEALTH.

Housing.—Except during the few months of winter, the climate of Bengal is generally uncongenial to these animals, and much depends, therefore, upon the kind of accommodation assigned to them. The house must be well protected from the sun, and be at the same time cool and airy; besides a copious supply of pure drinking water, there must be a bath into which it may be necessary to put a quantity of ice during the warmest days of summer: a grotto or dark chamber, with a platform for the animals to sleep upon, is also necessary. Like most other animals, bears are very susceptible to damp, which should be avoided as much as possible, so that, where the houses are low, a wooden platform, in addition to that inside their sleeping chamber, should be given them in the outer den also. In the construction of the house wood should be avoided as much as possible, as most bears are addicted to gnawing it; the wooden posts, when used should be lined with iron or zinc. These bears are powerful animals and some of them are mischievous also, so that accidents have sometimes happened by trusting to their previous good conduct and neglecting to take extra precautions in securing them: they have been known to bend three-quarters of an inch thick wrought-iron rods with ease where the cross bars of iron strengthening them were from 2 feet 6 inches to 3 feet apart.

Food.—May be fed with boiled rice, sugar, vegetables, fruits, eggs, bread, biscuits and milk; meat is occasionally given them, but every individual has not the same relish for it. Ordinarily boiled rice, sugar, a little milk and some vegetables are given them. One of the female brown bears is a great epicure, refusing to touch any food unless boiled eggs form a large proportion of it.

Transport.—For the reasons stated under "*housing*," an iron cage is indispensable when it is required to transport one of these animals. Not that they have never been conveyed in a wooden cage, but it is on the whole safer to have an iron one; the same style of cage as has been recommended for the transport of a lion or a tiger will also do well for a bear, but for the latter the top and bottom of the cage should also be made of iron gratings.

TREATMENT IN SICKNESS.

Teething.—Young brown bears have been known to suffer from *teething*. The animal when suffering from this ailment refuses food and salivates a good deal; if this continues for two or three days *diarrhœa* supervenes. No specific treatment has ever been adopted in such cases beyond giving milk and soup to support the strength of the animal, and aromatic chalk powder to check the *diarrhœa*.

Inflammation and ulceration of the lips are sometimes caused by an ill-tempered animal, especially if it is new to the place, rushing against the gratings of the den with violence, causing thereby slight abrasion of the mucous lining of the lips which become swollen and inflamed. An animal with such habits ought to have its cage so barricaded as to prevent visitors coming too close. Lips when ulcerated may be touched with weak solution of nitrate of silver or borax and honey.

Diarrhœa and *dysentery* are not uncommon among these animals; bael in the several forms already mentioned (page 3), Dover's powder, aromatic powder of chalk, are some of the medicines administered in checking them. By way of diet the animal should have milk and bread, soup and eggs if necessary.

Constipation from various causes is also not unfrequent; in ordinary mild cases 4 to 8 ounces of raisins will be found very effective; if, however, it is caused by *hepatic disorders*, 30 grains of chloride of ammonium should be given in milk and sugar every morning until a healthy system is attained.

Ulceration of the throat and mouth, probably brought on by exposure to chill and sudden change in the atmosphere, is a very troublesome complaint, causing a great deal of suffering to the beast. The animal when subject to this disease behaves as if something were sticking in its throat; it constantly opens its mouth, protrudes its tongue, and moves its head from side to side, indicating great discomfort and pain. The difficulty of treating such cases consists in inducing the patient to eat; this, however, may be overcome by confining the animal to milk diet alone for three or four days; by way of medicine chlorate of potash, 20 to 30 grains in each dose, may be administered with sugar and milk three times a day, and the mouth touched with weak lotion of nitrate of silver. These animals have been observed to abstain from food, without any apparent illness, for three or four days.

OBSERVATIONS ON THE HABITS OF BROWN BEARS.

The European brown bears are rather slow in their movements, and walk with measured steps, and though they often make a rush towards the gratings of their den, as a Himalayan brown bear does under similar circumstances, they appear to want the agility of the latter; this may, however, be due to the difference in their size and bulk. Both the European and the Himalayan forms shed their winter fur in March, and about this time they look much smaller than they did a few days before when they had their winter coats on; they are very fond of water, and may, during the summer especially, be constantly seen in their baths. They become somewhat noisy at the approach of feeding time, and of the two varieties the European is perhaps more

clamorous than the other. The noise they make is a sort of deep guttural wail with a nasal twang. When hungry they eat up their usual food, consisting of bread and milk or boiled rice and milk, with great rapidity. Their mode of attack is very peculiar. They stand erect on their hind legs, move backwards a step or two, and then plunge forward and strike round with their forepaws. When fighting between themselves, they also confront each other as above. They sometimes hug each other playfully, uttering, all the time they are thus engaged, a kind of monotonous howling cry often interrupted by an angry growl. Their vision appears to become somewhat affected by captivity. The Himalayan brown bears, especially adolescent animals, run very swiftly at a gallop. One of a pair of these beasts once managed to escape at night by climbing the sides of its cage, which was at that time built of stout gurrán poles; squeezing itself out through a small space between the roof and sides of the cage, it found its way into one of the unoccupied rooms of the arsenal in Fort William, and was captured the next day after much anxiety and trouble. Although the space through which it had escaped was closed in and all possible precautions taken to confine it, it escaped a second time by biting through a portion of the fencing. It was, however, discovered just outside the garden by one of the watchmen, whose attention was called to that direction by the barking of pariah dogs. The fugitive was soon circumvented and captured after an exciting chase all over the garden.

(107) THE GRIZZLY BEAR.

(*URSUS HORRIBILIS—Ord.*)

This species of bear attains to considerable size. The specimens exhibited in the collection were, however, small animals, the larger of the two, the male, not measuring more than 5 feet 9 inches. The front claws are comparatively larger than the hinder ones, and curved like those of the sloth bear. Fur coarse and abundant, longer on the neck than in the rest of the body; its colour varies from grey to blackish brown; the limbs, especially the lower parts, are much darker than the rest of the body: tail very small. In the specimens under observation the tail was scarcely visible in the winter, when the coat was dense and thick; they looked very pale in summer, when the coating became thin and ragged.

Hab.—North America, chiefly the Rocky Mountains and the open grassy plains and prairies adjacent.

LENGTH OF LIFE IN CAPTIVITY.

The maximum period of life of this species has been only three years and ten months.

TREATMENT IN HEALTH.

Housing.—This may be the same as for the brown bear, though modifications may always be necessary to suit special peculiarities.

Before they were three days in the garden, a pair of grizzly bears began damaging the roof of the sleeping chamber of their new habitation, so that it had to be raised and other incidental alterations made. These bears also must have plenty of water during the hot weather.

Food.—Grizzly bears have never appeared to be fond of animal food, their large canines notwithstanding. Their ordinary food consists of boiled rice, sugar, biscuits, and vegetables, besides which they consume a large quantity of fresh grass daily.

Transport.—This may be managed as in the case of a brown bear.

TREATMENT IN SICKNESS.

Both the specimens died somewhat suddenly. No autopsy was held in the case of the female; in that of the male, which died much later, the symptoms supported the conclusion that it had died from *convulsions*.

OBSERVATIONS ON THE HABITS OF A GRIZZLY BEAR.

A grizzly bear resembles the other species in manners and habits. The male bear exhibited in the garden was rather mischievous, as already mentioned. It would raise itself on its hind legs on the wooden platform to get at the roof, and, not content with simply scraping off the plaster, it would try to pull down the bricks also with its long, sharp claws. On one occasion it managed to escape by bending one of the wrought-iron rods forming the enclosure of the passage leading into the sleeping room. Though mischievously inclined it was neither savage or ill-tempered, so that, having got out, its next anxiety was how to return. Having moved a little way from the opening it had difficulty to rediscover it, and to do so it appeared to make more use of its sense of smell than of sight. These bears only became somewhat noisy at the approach of feeding-time.

An excellent account of the habits of this species in a wild state will be found in Richardson's *Zoology of the Northern Parts of British America*.

(108) THE HIMALAYAN BEAR.

(*URSUS TORQUATUS*—*Wagner*.)

Hindi—*Bhalu*. Bengali—*Bhaluk*.

The size of these animals varies considerably. A specimen, over 9 years old, from Mergui, at present living in the collection, does not exceed 3 feet in length from nose to seat. The largest Himalayan bear living in the garden measures over 7 feet 6 inches. The colour of this species is black throughout, excepting the white horse-shoe mark on the chest; the fur is very smooth, sleek, and abundant, especially during the winter: the tufts of longish hair on the shoulders, giving the appearance of a hump, are not so conspicuous in this species as in the brown bear. In young individuals the forehead and nose are sometimes grey, and the general colour also varies a great deal. In some individuals there is a large patch of white under the chin, while in others none or very little.

Hab.—The Himalayan black bear occurs throughout the forest regions of the Himalayas and extends through parts of Afghanistan into Beluchistan and the west frontier of Sindh. Eastwards it is found in the Assam ranges extending into Burmah, Pegu, and Tenasserim. The first authentic knowledge of its occurrence in Mergui was obtained by the acquisition of two young specimens from that place in 1883. The Himalayan black bear is also found in Southern China, Hainan and Formosa. The black bears said to occur in the plains of Eastern Bengal are likely to be of this species, as sloth bears are mostly distributed in Bengal along its western frontier and the countries bordering it.

LENGTH OF LIFE IN CAPTIVITY.

The longest period during which a Himalayan black bear has as yet lived in the garden has been a little over fifteen years, and it is still alive and well. It may be remarked in this connection that the animal referred to here lived for about eighteen years in the Viceroy's menagerie at Barrackpore prior to its presentation to this garden by His Excellency Lord Northbrook.*

TREATMENT IN HEALTH.

Housing.—The same general principle which has been recommended for the brown bear should also be observed in this case. The house which has been assigned to the large Himalayan bear has been one of the most successful habitations for bears in the garden, as the excellent health which its inmate has generally maintained demonstrates. The building consists of a dark cave, a central pit covered with a roof and provided with a bath, and a raised enclosure which serves for a promenade.

Food.—Boiled rice, boiled gram, bread, biscuits, fruits, vegetables, eggs and milk. Usually it gets either a seer of rice or gram boiled, about 4 ounces of sugar and some vegetables in the morning, a loaf of bread, some biscuits, an egg with some vegetables in the evening: the animal is extremely fond of sugarcane and juicy fruits; if an orange or a plantain be given, it immediately sets to peeling them in a most methodical and businesslike way. During the summer the large Himalayan bear is generally fed only once a day to prevent its getting fat. The feeding of an animal like this costs from Rs. 10 to Rs. 12 per mensem; smaller ones cost proportionately less.

Transport.—The same remarks as have been made with regard to the transport of a brown bear apply to bears generally.

Breeding.—Himalayan bears once bred in the garden, but the young one was unfortunately still-born.

TREATMENT IN SICKNESS.

Several deaths have been caused by *inflammation of the lungs*. When very young animals have been concerned and a diagnosis carefully made, fomentations have been applied and ammonia and vinegar internally administered, but as far as it is known without any success. *Diarrhoea* and *dysentery* are also common among Himalayan bears, but they soon yield to treatment when timely adopted.

* This animal has since died.

Congestion of the liver has been known to cause death of these bears: an animal lately succumbed to general debility and exhaustion caused by *hepatic disorders*. The only symptoms being constipation and want of appetite; an attempt was made to give it castor oil in milk, but it could not be induced to take or touch anything. On examining the body after death the liver was found to be enlarged, the gall bladder full of bile as black as ink, and the surface of the liver deeply coloured with bile pigments. This animal when alive was extremely lazy.

OBSERVATIONS ON THE HABITS OF HIMALAYAN BEARS.

The experience gained in the management of these bears in captivity does not support the belief that they are more savage than brown bears; it may be so in their wild state, but the case is certainly otherwise in captivity. The temper of bears can never be trusted, whether it be a black or brown bear. Although heavy in their movements, the young Himalayan bears are generally very active creatures, and extremely fond of, and expert in, mounting a tree. It is surprising with what ease and facility even a large and unwieldy beast sometimes climbs a tree or the bars of its cage. The large black bear in the collection is gradually becoming old, but three or four years ago it used at times to climb the bars of its cage and amuse itself by pulling down the straw from the projecting eave of the roof and breaking the ornamental fringes bordering it. It may still be seen walking round and round the narrow ledge of the wall of its pit, and it is astonishing how such a huge animal, which appears to move with difficulty owing to the great weight of its body, can walk and even turn round in a place where a man can hardly stand. The thickness and bulk of this beast are most apparent as he sits, human like, lolling against the side of the cage, one of the hind limbs drawn up and the corresponding forelimb resting upon it. It has been observed to be rather a common habit with animals in captivity that when they once become habituated to a particular place and mode of life they stoutly object to a change. This large bear is one of such animals. It having become necessary on one occasion to remove it to another part of the garden, a strong roomy cage was placed against the door of its house, and arrangements were made for its removal, but every attempt to induce it to enter the cage was frustrated. Although the animal had been starving for three or four days and was hungry and uncomfortable, it showed such dogged obstinacy that it became necessary to abandon the attempt. Himalayan black bears are seldom noisy, and they have never been observed to suck up their food like the brown or sloth bears. The habit of sucking the ear of a companion, or the animal's own limb, is not uncommon among creatures of this species.

(109) THE BLACK BEAR.

(*URSUS AMERICANUS—Pall.*)

The American black bear is a smaller animal than either the Himalayan black or the grizzly bears. An adult animal seldom exceeds 5 feet from the tip of the nose to the tail. The specimen living in the collection is about 4 feet in length and is uniformly black throughout, the nose and a portion above it is brown or greyish brown;

a whitish brown patch on each side of the lips; its forehead is slightly convex, ears prominent and oval, and are placed far apart than in the grizzly bear. The fur of the body long, shining and smooth, and that about the shoulders wavy. The claws are black and generally covered by the long dense hair of the feet.

Hab.—North America, from the Atlantic to the Pacific, and from Carolina River to the shores of the Arctic Sea.

LENGTH OF LIFE IN CAPTIVITY.

A specimen has been living since April 1888.

TREATMENT IN HEALTH.

Housing.—May be treated like the others. It must not be supposed that, as being an inhabitant of a cold and temperate region, it can be left exposed with impunity to draughts at night during the winter. During the summer it must have plenty of water in its bath, as it likes to wallow in it to keep itself cool.

Food.—The specimen now in the collection is fed on biscuits chiefly; vegetables and grass it also eats, but boiled rice has been found not to agree with it.

Transport.—The same as the other species.

TREATMENT IN SICKNESS.

This bear has several times suffered from *diarrhoea* and *hepatic disorders*; the former was probably due to unsuitable diet, and the latter to want of exercise. Change of diet and habitation did much good. While recovering from *diarrhoea* it became subject to a kind of skin disease; to arrest the progress of this, sulphur and borax, two parts of the former, and one part of the latter, were freely used as an external application, and had the desirable effect; flowers of sulphur mixed with sugar was given internally.

OBSERVATIONS ON ITS HABITS.

Mild in disposition. Unlike the brown and the grizzly bears, this animal is less addicted to rearing on its hind legs (though this may be the peculiarity of this particular animal, which is somewhat lazy in all its movements). It sleeps much during the day, and when the bath is empty makes use of it for a bed: during the winter it carries all the straw it is allowed for bedding to this place to lie upon. It receives caresses with evident delight, and is extremely friendly with the keeper. It is not at all noisy. For further information the books mentioned in connection with the grizzly bear may be consulted.

(110) THE MALAYAN BEAR.

(*URSUS MALAYANUS*—*Raffles.*)

Description.—A full-grown Malay bear seldom exceeds 4 feet and 6 inches in length. The chief characteristics of this species are its short fur, small and rounded ears, and a very long tongue. Its short and

broad skull gives it a peculiar physiognomy, and its short close fur makes it look elongated in form. The colour of the animal is black, the forehead grey, and the muzzle pale grey; chin almost whitish: a semi-circular yellowish white patch on the chest, which is, however, variable in size in different animals; claws are long and sharp and of a horny grey colour.

Hab.—In India, the Garo Hills and eastern districts of Hill Tipperah and Chittagong; found also in Tenasserim and Burmah, and extends through Malay peninsula into Sumatra, Java, and Borneo.

LENGTH OF LIFE IN CAPTIVITY.

The maximum period during which one has lived in the garden has been a little over three years only, from January 1876 to May 1879.

TREATMENT IN HEALTH.

Housing.—No special remarks are necessary on this point, except that as this species is particularly of an active habit and very fond of climbing trees, its habitation should be built accordingly. It would conduce greatly to their welfare if some arrangements and plan could be devised by which all bears in captivity in a hot climate could be compelled to take more exercise than they are in the habit of taking. The Malay bears do not require a bath, except occasionally during the very hot weather: during the winter they should be well protected from cold. The young and even adolescent beasts may be lodged with other species of the same age and strength, but older animals become pugnacious.

Food.—It thrives best on a mixed diet consisting of vegetables, boiled rice, bread, biscuit, egg, and milk. Ordinarily biscuit is the best food for this and other species. Young animals should have milk and bread or milk and soaked biscuit or boiled rice and sugar. These bears are extremely fond of honey and sweets in general, and are also fond of insects; they do not care for meat, but readily kill chickens and rats, and have been seen invariably to tear open the entrails, whether they eat them or not cannot, however, be said with certainty.

Transport.—Though small in size and less powerful than most other species, it is, nevertheless, an animal that requires careful handling. Its propensities to mischief are great, and it is ever seeking to escape from its prison; lately a specimen strangled itself while on board one of the river steamers from Assam to Calcutta.

TREATMENT IN SICKNESS.

An adult Malay bear, which lived longer than others of its kind in the garden, died from *diarrhœa* and *vomiting*; it was probably a case of *gastritis*. Young ones have sometimes been seen to die rather suddenly from *convulsions*: they also suffer from *teething*.

OBSERVATIONS ON THE HABITS OF A MALAYAN BEAR.

Far more active than other species whose habits have been observed in this garden; it paces its den constantly and rapidly, climbs the bars

of its cage and swings from them. It is generally good humoured and playful, and affords more amusement than other bears. The younger ones are excellent climbers, and, if allowed, will remain during the greater part of the day on a tree, scrambling from branch to branch or sitting hidden in its thick foliage. The adult Malayan bear, which lived in the garden between 1876 and 1879, was in the habit of snatching away umbrellas, sticks, hats, and caps from visitors who ventured too near its cage and evidently enjoyed the fun of their anxiety to get possession of the lost articles, which it never dropped until they were gone from the place. This bear exhibited a remarkable attachment to its keeper, whose caresses and attention it enjoyed and reciprocated.

(111) THE SLOTH BEAR.

(*MELURSUS URSINUS*—(*Shaw.*))

Bengali—*Bhaluk*.

This is the common bear of the plains. Its distinguishing characteristics are its elongated and mobile snout; large, powerful, and curved claws; coarse and shaggy fur, and short, unshapely hind legs. Its colour is black throughout, except the end of the muzzle, which is dirty grey; a white horse-shoe shaped mark on the chest; claws white or grey. The hair along the middle line of the back parted. The average length of a sloth bear is about 5 feet, males being larger than the females.

Hab.—Throughout the hilly and jungly parts of the peninsula of India; its western limit is Kattywar and Cutch, its range northward is limited by the Indian desert; but taking India generally, the northern range of the animal is the base of the Himalayas; its eastern limit is probably confined to Western Bengal. Specimens have been received from Midnapore, Orissa, Manbhoom, Sonthal Pergunnahs, Gya, Mirzapore, Hazaribagh, and its neighbourhood.

LENGTH OF LIFE IN CAPTIVITY.

Though living probably within twenty miles of Calcutta, these bears have been found not to bear captivity well, so that the longest period that a specimen ever lived in the garden has been only about six years.

TREATMENT IN HEALTH.

Housing.—Cages such as have been described for other species are suitable for this also. Wet, damp, and cold should be avoided as much as possible. The popular method of keeping bears in a pit, as in the London Zoological Garden, is altogether unsuited to a hot climate. The mortality among animals so treated was sufficient to demonstrate this.

Food.—Biscuits agree admirably with most bears, but some will not touch them. All like sweets more or less, and sugarcane is a favourite food of all. As in their wild state they chiefly feed on fruits, and insects, and, amongst other things, the fleshy sweet petals of the mowha flower (*Bassia latifolia*), which they greatly like, honey, the young of bees, beetles and larvæ, and ants, it is no wonder that they do not

thrive in captivity, many of these articles being difficult to procure at reasonable prices. Attempts were at one time made to lay in a stock of mowha flowers, but failed, as they would not keep fresh, and stale mowha was found to be deleterious rather than beneficial. On the whole, biscuits, bread, gram, Indian-corn, sugarcane, and various kinds of fruits are the articles of diet that can be most recommended for this or any other species of bear. In feeding sloth bears it must be remembered that they have a peculiar habit of sucking up their food, and it is therefore well to lubricate it if it happens to be boiled rice, bread, &c., with a little milk: fresh grass should always be given them. Sometimes animals become so partial to the food they are brought up on from infancy, that they would rather die of starvation than taste anything else. A pair of adolescent sloth bears were once sent down from upcountry, and in the usual course the ordinary food for bears was offered them, but though hungry they would not touch it; other articles of diet were supplied, but again they were left untouched; milk, bread, biscuits, sugarcane, fruits, vegetables, raisins, eggs, pupæ of ants,—in fact everything constituting a bear's diet was procured and in turn offered, without avail. At last it was ascertained that they were accustomed to feed on *chappati* and *dāl*. It was, however, too late for one of them, which had already died of starvation. The surviving beast is thriving apace on this diet.

Transport.—It may be transported like any other species.

TREATMENT IN SICKNESS.

Diarrhœa, *dysentery*, and *hepatic disorders* are the ailments from which these bears suffer in captivity. Bael in some form or other and aromatic powder of chalk are the best remedies for *diarrhœa*. In very mild cases no medicine should be given, but the diet changed.

OBSERVATIONS ON THE HABITS OF A SLOTH BEAR.

This bear is a familiar object, as it is the one commonly led about by jugglers and itinerant showmen and taught to dance. It has, it is believed, to suffer no little cruelty while being trained for these exhibitions. In captivity some sloth bears become very tame, but generally they are not sociable animals. The young ones are playful enough up to about a year old, repaying caresses and advances with their antics and amusing tricks. They appear to be more intelligent about this age than when they grow older. Confinement and adult age sour their temper. Like other species, they rear up on their hind legs when suddenly confronted or frightened, but cannot retain this position long. Under ordinary circumstances they are not noisy, but when angry utter a kind of rapid snorting grunt. This may be observed when an ill-tempered beast, resenting the approach of anybody near its cage, rushes towards him at full speed. The young ones are, however, more noisy; they have the curious habit of sucking their limbs, generally their forepaws, or the ears of a companion, keeping up the while a kind of continuous half-subdued humming sound. Adult bears are also known to do the same. They are excellent climbers.

For further information about the habits of these bears, Blanford's "Fauna of British India, Mammalia," and Colonel MacMaster's "Notes on Jerdon's Mammalia" may be consulted.

(112) THE TREE SHREW.

(TUPAIA ELLIOTI—*Waterhouse.*)

In general appearance it resembles a squirrel, but its teeth and pointed head show that it is not one. Its colour is yellowish brown, speckled above, with a variable tinge of rusty red on the upper surface of the tail, the rump and back. The whole upper surface is often uniformly rusty brown; lower surface of the body whitish or whitish grey; a distinct shoulder stripe present. Length of the head and body of a full-grown animal from 7 to 8 inches; tail with hairs 8 to 9 inches.

Hab.—A large part of the peninsula of India. The hills near Monghyr have supplied the garden with specimens.

LENGTH OF LIFE IN CAPTIVITY.

No specimen has lived in the garden for more than nine months.

TREATMENT IN HEALTH.

Housing.—Having regard to its habits in a wild state, it may be treated like a squirrel. It should have a tolerably large space, proportionate to its size and suitable to its active habits, carefully avoiding damp and wet. As it is not addicted to biting and gnawing like a squirrel, thin wooden frames may safely be used for its cage. A small retiring box is indispensable to its comfort.

Food.—Being insectivorous, it may be fed on cockroaches, grasshoppers, crickets, beetles, &c.; it also eats eggs, minced meat, and may be tried with bread and milk.

Transport.—No particular remarks are necessary, as it may be easily transported like civets and smaller cats.

Habits.—Its habits and movements, though essentially active, are distinguishable from those of a squirrel. It is very shy in captivity. For detailed information about the structure and distribution of this animal the following books may be consulted: "Anatomical and Zoological Researches"—Anderson; "Fauna of British India—Mammalia"—Blanford.

(113) HARDWICKE'S HEDGEHOG.

(ERINACEUS COLLARIS—*Gray & Hardw.*)

Hedgehogs are small ratlike insectivorous animals; their characteristic feature being the presence of small spines on the back and sides. They are popularly known as *Kantachua* or *Shahi-chua*—that is, spiny rat or porcupine rat. In this species the spines on the head are not divided by bare space in the middle line, and its colour is dark.

Hab.—Throughout the Punjab, Sindh, and North-Western India.

(114) THE SOUTH-INDIAN HEDGEHOG.

(ERINACEUS MICROPUS—*Blyth.*)

It is distinguished from the preceding species by having a naked furrow in the middle line of the head, thus dividing the spines into two groups and also by its pale colour.

Hab.—Plains of Southern India.

(115) THE COMMON HEDGEHOG.

(ERINACEUS EUROPÆUS—*Linn.*)

Hab.—The common hedgehog inhabits almost the whole of Europe excepting the northern countries. Its eastern limit is as far as the Caucasus.

LENGTH OF LIFE IN CAPTIVITY.

Of the Indian species one lived for about eighteen months. This cannot, however, be said to have been the maximum period of a hedgehog's life in the garden, as some of those that had been turned loose could occasionally be seen long after they had been set at liberty.

TREATMENT IN HEALTH.

As most of the Indian species inhabit the driest regions of the country, these animals are not likely, unless kept in a dry place, to thrive in the damp climate of Lower Bengal. Several methods of housing them have been tried. Perhaps the most effective was a wire cage, with plank bottom, raised about three feet off the ground; and as it formed one of a series built under a substantial shed, it was perfectly protected from moisture: the animal remained hidden under the thick straw bedding during the day. As other specimens were obtained, the plan of giving them an opportunity to burrow and live in comparative freedom was tried. In a well-drained spot, a masonry enclosure, 10 feet long, 5 feet broad, and about 4 feet deep, with solid brick-on-edge bottom, was prepared and filled up with earth; a wire cage placed over the whole and a number of hedgehogs put in. This was in winter, and for some months their appearance and habits indicated nothing but the success of the experiment. They came regularly out of their burrow every evening to feed and looked very lively and quite at home. During the rains, however, the earth in the masonry tank became saturated with moisture, and the creatures looked very dull and were less regular in attendance at their meals. One wet morning after a showery night the earth was found to have sunk considerably, burying some of the hedgehogs under the mud. Another batch of hedgehogs was turned altogether loose. These lived for some time and enjoyed their freedom. Some of them would show themselves of an evening close to the spot where they had been originally placed.

Food.—Grasshoppers, cockroaches, boiled eggs, and even bread and milk. One of those that were loose in the garden was observed feasting upon small mellipedes, which are numerous during the rains. It is also believed that they eat ants.

Transport.—This presents no difficulty, and requires no special contrivances.

Nothing is known with regard to their ailments.

HABITS IN CAPTIVITY.

Hedgehogs are nocturnal animals, and during the day remain concealed under the straw of the cage or any hiding place they can find. Though night feeders, they do not object to eating during the day in captivity, especially those that become familiar with their new surroundings. They have the peculiar habit of completely rolling themselves up into a ball when touched or disturbed. Hedgehogs, like porcupines, have the power of suddenly jerking backwards, no doubt for the same purpose of hurting their assailants; they never do so when they become tame and familiar. In captivity here they have never been heard to utter any sound.

(116) THE SMALLER GYMNURA.

(GYMNURA SUILLA—(Müller & Schleg.))

The smaller gymnura somewhat resembles a shrew. It has no spines, and the tail is naked or nearly so; head elongate, ears comparatively large and naked. The colour of the body above rusty brown, below yellowish white.

Hab.—The smaller gymnura is found in Burmah, the Malay peninsula, Sumatra, Java, &c. A specimen, said to have been captured in Tenassarim, was obtained in 1883.

LENGTH OF LIFE IN CAPTIVITY.

No specimen has hitherto lived in the garden longer than about eight months.

TREATMENT IN HEALTH.

Housing.—It is arboreal in habits, and may be treated like a tree shrew in this respect.

Food.—Cockroaches, grasshoppers, and various other insects and their larvæ; in captivity it will also eat eggs, bread and milk.

Habits.—The animal is nocturnal, but like many other nocturnal animals in captivity it is wakeful and active during the day; its movements are somewhat like a squirrel.

(117) THE GREY MUSK SHREW.

(CRÆCIDURA CÆRULEA—(Kerr.))

Hindi—*Chhuchandar*. Bengali—*Chhuncha*.

This animal is so common in Lower Bengal that any description is unnecessary.

Hab.—The same species that is found about the habitation in Bengal is also found in Burmah, Ceylon, and some islands of the Indian Ocean.

It has never been kept for exhibition, although specimens have several times been caught and temporarily placed in cages. They do not bear confinement well.

Food.—Its food consists of cockroaches, crickets, and other insects. It also eats minced meat and frogs. During the early part of the rains, when tiny frogs are abundant, a musk shrew may sometimes be seen feasting on them.

During July and August young musk shrews may be seen accompanying an old one, probably their mother, in her foraging excursions round a room or habitation. When kept in cages they remain completely hidden under the straw during the day.

(118) THE INDIAN FRUIT BAT OR FLYING FOX.

(PTEROPUS MEDIUS—*Temm.*)Bengali—*Badul* or *Badur*.

This is a common animal in Bengal. Its colour varies. Some specimens are much lighter than others.

Hab.—The flying fox is found throughout India, Burmah, and Ceylon.

LENGTH OF LIFE IN CAPTIVITY.

Specimens have been living since 1881.

TREATMENT IN HEALTH.

Housing.—Their cage must be high, shady, and cool, as they are in the habit of roosting in a retired place during the day, and cannot bear light or much heat. In this garden the flying foxes are kept in one of the divisions of a large aviary, in company with the crows and magpies. Though incongruous, the arrangement has not been disturbed, as the heterogenous party appear to do well and live in harmony. The flying foxes hang head downwards, and prefer to claw with their hind feet on to the wire netting of the cage, disregarding the sticks which are placed across the cage for their use.

Food.—Flying foxes are fruit-eating animals, and feed on all sorts of garden fruits—plantains, jamun (*Euginea jambolana*), almond, various kinds of figs and other fruits. In captivity they readily eat bread and

milk, biscuits and boiled rice, and drink often, especially during the summer.

Breeding.—Flying foxes have several times bred in the garden, and have only one young at a birth. It firmly clings to the breast of the mother, and remains in that position for about a month.

Transport.—Flying foxes are by no means amiable in disposition, and if a number of them are confined in a small space, they are apt to quarrel and bite each other. There must be some netting or bars in the cage from which they can suspend themselves.

OBSERVATIONS ON THE HABITS OF FLYING FOXES.

Their curious instinct of hanging head downwards has already been mentioned. They do this nearly all day. The head is slightly raised, and the chin touches the chest. Sometimes also the creature envelops itself in its wing membrane. The specimens in this garden afford an excellent illustration of the adaptation of habits to external circumstances and altered conditions of life. Although essentially nocturnal animals in their wild state, in captivity they feed and drink regularly during the day. They watch keenly for their food, and as it is placed inside the cage they scramble down the wire netting, and while still holding on to the wire snatch a plantain or a piece of any other food and scramble up again. Like other animals, they will quarrel for the same object, whether food or other trifle. In captivity they are seldom noisy. Their large ears are very sensitive, and may often be seen in a state of vibratory movement. They have a disagreeable smell.

(119) THE LESSER FRUIT BAT.

(CYNOPTERUS MARGINATUS—(Geoffr.))

Bengali—*Cham-chika*.

Very common in Bengal. The size and colour vary in the specimens obtained from different localities. Its distinguishing feature is a white narrow margin in the ears. Size very small, a full-grown animal varying from $3\frac{1}{2}$ to $4\frac{1}{2}$ inches.

Hab.—Found throughout India.

These animals do not appear to bear captivity well, and they are so well known that perhaps it would be better to dispense with the exhibition of them in Calcutta. They are exclusively frugivorous, and hundreds may be seen of an evening congregating round a fruit-tree or a plantain grove. Sometimes they venture inside a house, and dazzled by the light flutter about. During the day they roost on the eaves and rafters of old buildings, and under the surface of the plantain leaves.

(120) THE BLACK HILL SQUIRREL.

(SCIURUS GIGANTEUS—McClelland.)

All squirrels are designated *Gilhere* in Hindustani and *Katbidal* in Bengali. No specific distinction is popularly recognized.

Description.—Length without tail more than 12 inches; black or dark brown above, brownish yellow below; ears tufted; thickness and length of the tuft vary.

Hab.—Himalayas, from Nepal to Assam, the hills between Assam and Burmah and Upper Burmah. All the specimens exhibited were from Tipperah.

LENGTH OF LIFE IN CAPTIVITY.

No record of the actual period during which any of them lived has been kept, but they have been found to be generally hardy, and to bear captivity well.

(121) THE JAVAN SQUIRREL.

(SCIURUS BICOLOR—*Sparrr.*)

No ear tuft present. The colour of the body varies in different specimens. One obtained from Batavia had the upper part of the body grizzled yellowish, head, cheeks and throat whitish or greyish white; feet and tail black; the nose and chin also of the same colour.

Hab.—Lower Burmah, all through Tenasserim and the Malayan peninsula, the islands of Sumatra, Java, and Borneo.

LENGTH OF LIFE IN CAPTIVITY.

Nearly four years.

(122) THE LARGE INDIAN SQUIRREL.

(SCIURUS INDICUS—*Ersl.*)

Of the same size as the *S. Giganteus*; red and black above, with a yellow occipital patch; feet yellow like the under surface; ears very fully tufted. Most of the specimens exhibited here were of a chestnut red above, but the shades vary according to the locality from which they are obtained.

Hab.—The Indian peninsula generally, south of the Gangetic plains from Cuttack to Travancore; has also been received from the Nepal Terai and Manipur.

LENGTH OF LIFE IN CAPTIVITY.

Upwards of nine years.

(123) THE LONG-TAILED SQUIRREL.

(SCIURUS MACROURUS—*Ersl.*)

The colour of the upper surface of the body grizzled black and white; a yellow or white occipital patch; feet black; the outside of the limbs amber yellow like the under surface; ears very slightly tufted.

Hab.—The hill ranges of Southern India, Nilgiris, Shevaroy's, and Ghâts of Travancore and Ceylon.

LENGTH OF LIFE IN CAPTIVITY.

About six years.

(124) THE HOARY-BELLIED GREY SQUIRREL.

(SCIURUS LOKROIDES—*Hodgs.*)

Smaller than any of the preceding species; length of the head and body about 8 inches; tail about 6 inches; colour of the body above rufous olive brown; under surface much paler, or rufous hoary.

Hab.—From Nepal eastwards through the Himalayas to Assam, and southwards through Manipur to Arracan, Preparis Island and Upper Burmah. The specimen exhibited here was received from the district of Jessore.

A black variety, referable to this species, was obtained from Cachar.

LENGTH OF LIFE IN CAPTIVITY.

From 1880 to 1889.

(125) THE COMMON STRIPED SQUIRREL.

(SCIURUS PALMARUM—*Linn.*)

Well known in Bengal, and abundantly found in a wild state within the garden.

Hab.—Found all over the peninsula of India from the Terai region of the Himalayas southwards; westwards as far as Persian Beluchistan; and eastwards as far as the north-eastern boundary of the district of 24-Pergunnahs.

(126) THE ORANGE-BELLIED GREY SQUIRREL.

(SCIURUS BLANFORDI—*Blyth.*)

Grey above; tail tip black; feet yellow; below orange.

Hab.—Upper Burmah.

LENGTH OF LIFE IN CAPTIVITY.

Two years and about five months.

(127) THE RUFOUS-NECKED SQUIRREL.

(SCIURUS PREVOSTI—*Desm.*)

Upper parts black; tip of the tail with a reddish chestnut tint; the side of the face and lower jaw, the side of the neck and the shoulder and humeral region greyish white; a broad band of yellowish white runs along the side, extending over the outside of the thigh to the heel; under parts maroon chestnut.

This species is subject to great variations, according as they inhabit different areas; but so constant and well marked these variations are

that zoologists have divided them into local races. One of these commonly exhibited is the Sumatran race (*S. rafflesii*). It is distinguished from others by a large white spot on the side of the muzzle, by its greyish or brownish cheeks and side of the neck, and by its red fore limb and shoulder. A variety with under parts white has also been exhibited.

Hab.—The Malay peninsula, Sumatra, Banka, Billiton, Borneo, and the Celebes.

LENGTH OF LIFE IN CAPTIVITY.

Nearly five years.

(128) THE PLANTAIN SQUIRREL.

(*SCIURUS PLANTANI*—*Ljung.*)

Olive brown in colour.

Hab.—Common in the islands of the Indian Archipelago.

A young specimen lived for about three months only.

(129) THE GREY SQUIRREL.

(*SCIURUS CINEREUS*—*Linn.*)

Of an uniform greyish brown colour; tail bushy; under parts white; sides of the face and feet with yellowish cinereous tint.

Hab.—Eastern United States westward to the plains.

LENGTH OF LIFE IN CAPTIVITY.

A specimen is living since 1881.

(130) THE COMMON SQUIRREL.

(*SCIURUS VULGARIS*—*Linn.*)

Brownish red above; under parts white.

Hab.—Europe and Northern Asia, as far south as the Caucasus, Thibet, and Northern China.

LENGTH OF LIFE IN CAPTIVITY.

Nearly eighteen months.

(131) THE RED-BELLIED FLYING SQUIRREL.

(*PTEROMYS MAGNIFICUS*—*Hodgs.*)

The limbs are united by an expanded membrane; colour of the back dark maroon chestnut, with black tips to the hairs; the head and neck also of the same colour, with yellowish tints; the hairs about the

muzzle and eye almost black; the expanded membrane is yellow near the back and orange red towards the external margin; the yellow of the membrane extends over the shoulder; the limbs orange red; the tail orange red, broadly tipped with black; the under parts are pale orange red; total length of the body about 16 inches, tail 22 inches.

Hab.—Himalayas from Nepal to Sikkim; has also been received from the Khasia Hills. The specimen living in the garden was obtained near Darjeeling.

LENGTH OF LIFE IN CAPTIVITY.

Living since 1880.

(132) THE GREY FLYING SQUIRREL.

(SCIUROPTERUS FIMBRIATUS—*Gray.*)

Of a pale greyish colour above, hair on the outer edge of the hind foot thick and bushy, extending from the tarsal joint to the base of the fifth toe.

Hab.—North-West Himalayas from Gilgit to Kumaon.

LENGTH OF LIFE IN CAPTIVITY.

About three years.

TREATMENT IN HEALTH.

Housing.—The frame work of a squirrel's cage should be made of T or angle iron, as wooden posts are generally gnawed through, especially by larger species. The netting used should be woven of stout galvanized wire, of small enough mesh to prevent the smaller squirrels escaping; the size of the cage should be at least 4 feet square. A series of such cages built on a platform about 3 feet high under a permanent shed or *chabutra* is, perhaps, the best accommodation that can be assigned them. The platform may be either a brick-built one with ventilators below, or made of 1 inch thick planks resting on posts; the partition of the cages should also be made of planks, with holes here and there for ventilation. Each cage should be provided with a retiring box fastened to the partition wall a few inches below the roof. A bedding of hay or straw, both inside the box and on the floor of the cage, will be much appreciated by the animals; avoid wet, damp, and cold. The cages for flying squirrels should be larger and higher, with dark corners for the animals to retire during the day. A thick tuft of jute or hemp hung from a corner of the roof, some balls, or an ordinary wheeled bar, logs of wood, will give them occupation and enjoyment.

Food.—Fruits, nuts, biscuits, gram, Indian-corn, and other grains and vegetables. Soft food should be avoided as much as possible; clean drinking-water always.

Breeding.—Except the common striped species, squirrels have not bred in this garden: they rarely breed in captivity.

Transport.—A cage two feet long, about a foot broad and high will accommodate a pair. It should be boarded on all sides except the front, where wire netting should be employed. There should be a shelf inside the cage for the animals to sleep upon; a straw or hay bedding will give them both warmth and concealment, if necessary. A little projection from a side of the cage to introduce the feeding and drinking vessels is a better arrangement than placing them on the bottom. If possible, flying squirrels should not be brought down to the plains in summer.

TREATMENT IN SICKNESS.

Worms in the stomach and intestines have been found after death. If their presence is detected when the animal is alive, one or two areca nuts daily for a few days will do the patient good; a few drops of oil of turpentine dissolved in about half a tea-spoonful of castor or olive oil is an efficacious remedy. It may be made into an emulsion by beating it with yolk of egg. Biscuits or bread smeared with it will be readily eaten. *Abnormal growth* of the front-cutting teeth, or incisors, is generally induced by improper feeding. It may be arrested by feeding the animal on hard substances; but if immediate relief be necessary, filing of the teeth should be resorted to. The squirrels, and for that matter all rodents, require something hard to nibble at to keep down the growing point of their incisors, and a few cocoanut shells and small logs of wood should therefore be allowed them. *Inflammation* of the lungs is another complaint from which squirrels have been known to suffer.

OBSERVATIONS ON THE HABITS OF SQUIRRELS.

Squirrels are restless, inquisitive creatures, always supremely busy about nothing. Some of them become so tame in captivity that, on a cage being approached, its inmate may invariably be seen at its side awaiting food or a friendly greeting. If a nut or a bit of bread be thrown in, it at once springs upon it kitten fashion, takes it into its fore paws, sits upon its haunches, with its bushy tail arching upon its back, and begins devouring the morsel bit by bit; if alarmed, it bounds away uttering sharp chirping notes, and seeks concealment in its nest box. Soon it may be seen peering from the nest-hole, satisfied that there is nothing to be afraid of ventures out, but quickly withdraws on the first alarm. Most of the Indian species are tamer than most of those from the Malayan islands. The flying squirrels are nocturnal animals; they sleep during the day and come out at night.

(133) THE HIMALAYAN MARMOT.

(*ARCTOMYS HODGSONI*—*Blanf.*)

Description.—Form thick-set, legs short, tail short, general colour dark grey with a rufous tinge; fur of the head and back mixed with black; tip of the tail dusky brown.

Hab.—Nepal, Sikhim, and Bhutan.

LENGTH OF LIFE IN CAPTIVITY.

Over three years.

(134) THE QUEBEC MARMOT.

(ARCTOMYS MONAX—(Linn.))

Hab.—Extends as far northward as the Hudson's Bay, and westward from the Atlantic coast to Missouri, Iowa, and Minnesota.

LENGTH OF LIFE IN CAPTIVITY.

From November 1880 to June 1884.

TREATMENT IN HEALTH.

With regard to *housing* and *feeding*, the marmots should be generally treated like the squirrels, a cool and well-ventilated cage being the principal requisite. It is a burrowing animal and appreciates a mound of dry clayey earth, which may be given in a tray about 18 inches square and about 9 inches or a foot deep. During the hot weather a bath should be provided, but as it has never been observed to readily take to water, a cold douche may be applied by a garden syringe.

OBSERVATIONS ON THE HABITS OF MARMOTS.

Marmots are retiring in disposition, remaining during the greater part of the day inside a box or buried in earth or straw. Specimens exhibited in this garden regularly lost their fur during summer, and assumed a new coat at the approach of winter.

(135) THE PRAIRIE MARMOT.

(CYNOMIS LUDOVICIANUS—(Ord.))

Description.—It resembles the marmot, but is somewhat smaller; colour of the upper surface of the body reddish brown, with a few grey and black hairs scattered here and there; the under surface of the body brownish white; tail short and somewhat flattened.

Hab.—North America; the prairies east of the Rocky Mountains.

LENGTH OF LIFE IN CAPTIVITY.

Living since April 1884.

TREATMENT IN HEALTH.

Housing.—Ordinarily these animals may also be housed like the Himalayan and the Quebec marmots, but they would prefer being kept loose on a small island, where they can dig and burrow as they like. A number of them were once placed on a large island overgrown with trees and shrubs, but they all disappeared within a short time: whether they were devoured by the crocodiles which then infested the tank, or drowned in their attempts to swim over to the mainland was never ascertained.

Food.—In addition to such articles of food as are mentioned under the squirrel, these animals should have grass and roots.

OBSERVATIONS ON THE HABITS OF PRAIRIE MARMOTS.

These animals are fond of living together, and are extremely wary, shy and quick in their movements. They burrow with astonishing rapidity, and their power of deep mining was tested by placing about a dozen of them inside a kiosk, of which the foundation walls were sunk some 6 feet deep to prevent their digging out. The result, however, proved the utter futility of the precaution, which was, of course, adopted in ignorance of their habit of deep digging.

(136) THE COMMON DORMOUSE.

(MYOXUS AVELLANARIUS—(Linn.))

About $3\frac{1}{2}$ inches in length, with a bushy tail, and of a reddish tawny colour.

Hab.—Widely distributed over Europe.

A specimen lived for about a month only.

(137) to (145).

No detailed description is required.

The rats from No. 137 to No. 145 may be exhibited in small boxes with perforated zinc sides and glass front, placed on tables or shelves in the side of a house. The rats may be fed like any other smaller rodents, but they are omnivorous, and when hungry will nibble at bones, meat and eggs.

(146) THE RED-CHEEKED BAMBOO RAT.

(RHIZOMYS ERYTHROGENYS—*Andr.*)

The distinguishing characteristics of this species are its bright golden red cheeks and sides of the head generally, the dark occipital line extending forwards to between the eyes, and the absence of any white mark on the forehead, which is present in the allied species (*R. Sumatrensis*). Total length from the tip of the nose to the end of the tail more than 14 inches.

Hab.—Shan States of Upper Burmah and Mergui.

LENGTH OF LIFE IN CAPTIVITY.

It met with accidental death after having lived for about three months only.

(147) THE CHESTNUT-COLOURED BAMBOO RAT.

(RHIZOMYS BADIUS—*Hodgs.*)

Smaller in size than the preceding species; colour of the fur chestnut; quite adult specimens are slaty grey.

Hab.—Found in the Himalayas from Nepal eastwards and extends through Assam Manipur, and Arracan to Burmah. It does not appear to be found further south than the northern part of Tenasserim.

LENGTH OF LIFE IN CAPTIVITY.

There is no record of the actual period, but specimens have been known to thrive well for at least three years.

(148) THE COYPU.

(MYOPOTAMUS COYPU—(Möl.))

Description.—Length about 23 inches; general colour of the body above dusky brown; the sides and underparts brownish yellow; the muzzle and chin white; tail thick and tapering; ears small; front-cutting teeth large and powerful.

Hab.—South America.

LENGTH OF LIFE IN CAPTIVITY.

From June 1882 to December 1885.

TREATMENT IN HEALTH.

Housing.—The bamboo rats should be treated like the marmots. The experiment of allowing them to burrow underground was tried, but unfortunately resulted in the death of the animals for whose benefit the arrangements were made. The ground sunk after a heavy shower, and the animals were buried alive. The coypu rat must have water, and an accommodation similar to that recommended for the otter is most suitable. In building its cage $\frac{1}{4}$ inch iron rods should be used, as it will easily cut through any wire netting, however stout.

Food.—The same as squirrels and other rodents. In their wild state the bamboo rats feed largely upon roots of bamboos. This may easily be supplied in captivity also.

OBSERVATIONS ON THE HABITS OF BAMBOO AND COYPU RATS.

Bamboo rats are lazy, but not shy or timid; during the day they sleep much; the coypu is very sociable in disposition, fond of water, and rather awkward in their movements on land.

(149) THE SHORT-SPINED PORCUPINE.

(HYSTRIX LONGICAUDA—Marsden.)

Hindi—*Shahi*. Bengali—*Sājāru*.

Very common all over Bengal, and found in a wild state within the garden.

Hab.—Himalayas from Nepal eastwards, Lower Bengal, Assam, Burmah, and the Malayan peninsula, extending to the islands of Sumatra and Borneo.

Specimens obtained from Java appeared to differ in no way from the present species.

LENGTH OF LIFE IN CAPTIVITY.

Some have been living since 1878.

(150) THE INDIAN CRESTED PORCUPINE.

(HYSTRIX LEUCURUS—*Sykes.*)

Hab.—India as far west as Sindh and Beluchistan; northwards extending to the Himalayas, and southwards to Ceylon. It is not found in Lower Bengal. Its eastern limit probably does not extend beyond Hazaribagh.

(151) THE EUROPEAN CRESTED PORCUPINE.

(HYSTRIX CRISTATA—(*Linn.*))

This species does not appear to be specifically distinct from the Indian crested porcupine, so far as its external appearance is concerned.

Hab.—Southern Europe and Northern Africa, ranging as far as Zanzibar. A pair exhibited here some years ago came from the latter country.

LENGTH OF LIFE IN CAPTIVITY.

From January 1878 to April 1881.

(152) THE BRUSH-TAILED PORCUPINE.

(ATHERURA FASCICULATA—(*Shaw.*))

Smaller in size than any of the preceding genus; head more pointed, tail long and ratlike, terminated by a tuft of bristly spines, which are simple and flattened, and not twisted and irregularly dilated. The spines of the body are softer than those of the other genus.

Hab.—Siam.

A brush-tailed porcupine* has recently been obtained from Darjeeling hills. As it was purchased by its donor from a Bhutea, its true habitat cannot be vouched for. None had hitherto been found north of Tipperah.

(153) THE AFRICAN BRUSH-TAILED PORCUPINE.

(ATHERURA AFRICANA—*Gray.*)

Although specifically distinct, it resembles the preceding species in appearance.

Hab.—Western Africa.

* The caudal bristles of this specimen are twisted and irregularly flattened, and it is therefore referable to *A. Macroura*, *Linn.*

LENGTH OF LIFE IN CAPTIVITY.

Over eight years.

TREATMENT IN HEALTH.

Housing.—The cage for porcupines should be built of iron and brick only, the floor and walls up to about 2 feet, being thickly plastered with cement and lime to resist their formidable teeth; a grotto to afford concealment during the day should be provided; the brush-tailed porcupines are less given to gnawing, and may therefore be safely accommodated in a lighter cage. Strong lights should be avoided. Keep only well-matched pairs together, otherwise they fight to death.

Food.—Grain, roots and grass.

Breeding.—The short-spined porcupines have bred and reared their young several times. The young are born with their eyes open, and their spines are very soft, and lie close to the body. Generally there are only two young at a birth, and there is only one brood in a year. The males sometimes devour the young before they are many hours old, and it is therefore better to separate them.

Transport.—For such a destructive animal, the travelling cage should be made of iron. If wood is used, it should be thoroughly lined with zinc.

Nothing particular is known about their ailments.

OBSERVATIONS ON THE HABITS OF PORCUPINES.

Though perfectly nocturnal in their wild state, those that have for some time lived in captivity behave like any other diurnal animal, and feed and drink during the day. They are as a rule more lively towards the evening. Porcupines are much given to fighting among themselves, and animals defaced by wounds inflicted upon one another are not uncommon. They rush upon each other sideways and backwards with quills erect and rattling, and adopt the same tactics towards other assailants also. The brush-tailed porcupines are milder in disposition, and less given to gnawing and fighting. A very peculiar habit of circling round and round a given space was constantly observed in some of those exhibited in this garden.

(154) THE VISCACHA.

(LAGOSTOMUS TRICHODACTYLUS—*Brookes.*)

Description.—It has the general appearance of a hare, but of a much heavier build, with proportionally heavier head; tail long and tufted; fur soft and downy, and of a mottled grey colour above and yellowish white beneath; a white band crosses the muzzle and runs backwards to each eye; length about 18 inches.

Hab.—South America.

LENGTH OF LIFE IN CAPTIVITY.

Two years and ten months.

(155) THE SPOTTED CAVY.

(CELOGENYS PACA—(Linn.))

Description.—About 2 feet long, of a compact form, limbs slender, colour of the hair of the back and sides yellowish brown; beneath white; upon each side of the body are arranged rows of white spots. The most characteristic feature of the species is the cavity in the cheek, formed by the expansion and development of the zygomatic arches, and opening into the mouth by a small aperture.

Hab.—Central and South America.

LENGTH OF LIFE IN CAPTIVITY.

From June 1882 to January 1885.

(156) THE CENTRAL AMERICAN AGOUTI.

(DASYPROCTA ISTHMICA—Alston.)

Hab.—Central America.

(157) THE HAIRY-RUMPED AGOUTI.

(DASYPROCTA PRYMNOLOPHA—Wagl.)

Hab.—Guiana.

The agoutis resemble the mouse deer (pages 159-60) in external appearance, but are of a heavier build; general colour of the body chocolate brown. The hair of the latter species is somewhat longer on the hinder quarters, and of a dark colour.

LENGTH OF LIFE IN CAPTIVITY.

One of the former obtained in 1878 is still alive.

(158) THE GUINEA PIG.

(CAVIA PORCELLUS—(Linn.))

Hab.—South America.

TREATMENT IN HEALTH.

Housing.—The viscacha and the spotted cavy may be generally treated like the marmots, with this exception that the spotted cavy is fond of water, and provision should be made to supply it. For the agoutis and guinea pigs no earth is necessary, but they must have retiring boxes for concealment.

Food.—Like other rodents, they feed on grain, vegetables, roots, and biscuits; fresh kalmi (*Convolvulus reptans*) should be given to the guinea pigs.

Breeding.—The agoutis and guinea pigs are prolific animals and have several broods during a year. The former have on several occasions been known to eat up their young.

Transport.—Agoutis are given to gnawing, especially if the travelling cage be built of soft wood.

OBSERVATIONS ON THEIR HABITS.

The viscacha is a very lazy animal, and awkward in its movements. Those exhibited here were not shy, but approached anybody and sniffed at everything; they slept much during the day. The spotted cavy is also a nocturnal animal, and is therefore found sleeping almost the whole day. It is, however, more active than the viscacha. An opportunity having once been given to a Paca or spotted Cavy to burrow, it made a hole about 6 feet deep. Agoutis are unsociable animals, and of rather solitary habits, though generally quiet and unobtrusive; they are quick in their movements and capable of inflicting severe teeth wounds on assailants. These animals have been repeatedly observed to stow away food, mostly ship biscuits, under the sand or straw bedding of their cage, stamping the ground above several times with their hind legs, probably to make sure that the property is well and securely buried. They are cleanly animals, and spend much time, especially after each meal, in cleaning their lips and faces with their fore paws. The guinea pigs are restless, active, inquisitive and squeaking animals, always fighting among themselves, especially if there be odd males, or weak and sickly animals. They are nevertheless sociable creatures and like to live in company.

(159) THE CAPYBARA.

(HYDROCHÆRUS CAPYBARA—*Erxl.*)

Description.—Length nearly 4 feet; height at the shoulders about 20 inches; stout and massive; head large; muzzle broad, eyes and ears small; no tail; feet webbed; coat of coarse hair, of moderate length, and of reddish brown colour.

Hab.—The eastern part of South America.

LENGTH OF LIFE IN CAPTIVITY.

Living since April 1884.

TREATMENT IN HEALTH.

Housing.—A large open and shady enclosure with a tank is by far the best accommodation for this animal. Here it can indulge in its favourite habits of swimming and wallowing as much as it likes, while the grassy lawn affords it pasturage. The wall or fencing of the enclosure should be at least 5 feet high, as it has been found capable of clearing a wall more than 3 feet high. Economy of space, however, is always a consideration in finding accommodation for animals, and if

for this reason it is not possible to devote such an enclosure to it alone, it may be located with other animals of similar habits. In this garden a capybara lived happily for a long time with a Malayan tapir, but before such animals are introduced to each other their temper should be thoroughly known, and their dispositions towards each other ascertained. The same animal has now been living contentedly in another house, to which a large grassy lawn is attached, and here it forages with the kangaroos and wallabies; but to have no water for swimming and wallowing is a great deprivation to the beast, especially during the hot weather.

Food.—Grain, roots, bark, and grass.

Transport.—An iron cage should be provided.

The specimen that has been living in the garden has always maintained excellent health, so that nothing is known about its ailments.

OBSERVATIONS ON THE HABITS OF A CAPYBARA.

Although it swims and dives with great ease, and delights in water, it is more terrestrial than aquatic in habits, spending more time on land than in water. A capybara readily becomes reconciled to captivity, and behaves as if it were the most natural thing for it to live in confinement in the plains of Bengal. While living with a Malayan tapir, the animal here alluded to often indulged in frolicsome games with the former, and amused itself by riding on its back while both were in the water.

(160) THE INDIAN HARE.

(*LEPUS RUFICAUDATUS*—*Geoffr.*)

Hindi—*Khargosh*. Bengali—*Kharra*.

Hab.—Northern India, from the Punjab to Bengal, extending from the lower ranges of the Himalayas to the Tapti and Godaveri rivers.

(161) THE COMMON RABBIT.

(*LEPUS CUNICULUS*—*Linn.*)

Hab.—Southern and Western Europe and North Africa. Only the domestic variety has been exhibited.

(162) THE HISPID HARE.

(*CAPROLAGUS HISPIDUS*—*Blyth.*)

General colour iron grey, with a brownish ruddy tinge; limbs shaded externally with black; the ears very short and broad.

Hab.—The Terai at the base of the Himalayas from Nepal to Assam, extending southwards to Dacca.

A specimen lived for about three months only.

(163) THE INDIAN ELEPHANT.

(ELEPHAS INDICUS—*F. Cuvier.*)

The elephant is too well-known an animal all over India to require much description; but individual specimens vary from good to bad, and some experience is necessary to distinguish them. The following notes may be found useful by those who have not access to larger works:—

“Elephants are divided into three classes* :—

“Koomeriah or thorough-bred.

“Dwasala or half-bred.

“Mirga or third-rate.

“The parts of a koomeriah are—

“Barrel deep and of great girth; legs short (especially the hind ones) and colossal; the front pair convex on the front side, from the development of muscle; back straight and flat, but sloping from shoulder to tail, as a standing elephant must be high in front; head and chest massive; neck thick and short; trunk broad at the base and heavy throughout; hump between the eyes prominent; cheeks full; eyes full, bright and kindly; hind quarters square and plump; the skin rumpled, inclining to fold at the root of the tail, and soft; tail long and well feathered.

“If the face, base of trunk and ears be blotched with cream-coloured markings, the animal's value is enhanced. The dwasala class comprises all those below this standard, not descending so low as the third class.

“The parts of a mirga are —

“Legginess, lankiness and weediness; arched sharp ridged back, difficult to load and liable to galling; trunk thin, flabby and pendulous; neck long and lean; falling off behind; hide thin; head small; eye piggish and restless; and altogether unthrifty, which no feeding improves.”

Hab.—The Terai regions of the Himalayas, Assam, Cachar, Burmah and Siam, extending southwards to the Malayan peninsula; elephants are also found in Southern and Central India, and were not uncommon some thirty years ago in the Sonthal Pergunnahs.

LENGTH OF LIFE IN CAPTIVITY.

In proportion to its costliness it is not an attractive animal, especially to the Indian public, and is therefore not always exhibited in the garden; one or two young animals are, however, generally on view during the cold weather awaiting transmission to some Zoological Society in Europe, or Australia.

TREATMENT IN HEALTH.

Housing.—No shed is necessary for an adult or adolescent animal; it may be picketed in the midst of a grove, or under the shade of a large tree; a masonry platform about a foot high, and sloping on one side should be provided with posts in front and behind to which the animal should be secured. For young animals, such as are generally acquired, a shed of some sort is necessary, especially during the cold winter nights, and to shelter them from continuous heavy rains

* Notes by Captain H. Wilberforce Clarke, R.E., on elephants.

during the wet weather. It may be built of corrugated iron, or planks with old rail posts over a platform, and barricaded round, so that, if necessary, the young animal can be kept loose inside the enclosure. The attendant should remain near his charge at night, as otherwise jackals and other nocturnal animals have been observed to cause young elephants much fright and unrest; he should, therefore, be allowed a small hut at one end of the shed. Ordinarily an elephant should be picketed by one of its hind feet, and to prevent injury to the skin being caused by constant friction of the chain or rope, a piece of tough leather or hide should be used as a leg protector. A healthy elephant should be bathed at least once a day, and allowed to remain in the water for about an hour; while in the water it should be well rubbed with *jhamas* (vetrified brick); during the hot weather it should be bathed twice a day. Young elephants should have some clothing at nights during the cold season. To secure an elephant, fetters consisting of one *bandhan* (chain), one *beri* (anklet), one noose, and some rope for emergencies are enough for ordinary purposes.

Food.—A full-grown elephant requires 6 to 7 maunds of green fodder daily. Various kinds of grass, especially *dāl*, green paddy plants, &c., constitute its natural food. In Bengal elephants are chiefly fed on leaves and branches of various kinds of fig trees; it is, however, recommended by the best authorities that they should, as much as possible, be restricted to their natural diet consisting of various kinds of grass. Elephants are very fond of sugarcane, which may always be given with impunity. In captivity, 6 to 8 seers of uncooked rice or dhan (paddy), with a little salt, and a few bundles of paddy straw, should be daily allowed; but it is most important to remember that no amount of good feeding on rice, dhan, or any other nutritious grain will compensate for a continued short allowance of fodder. In most places in Bengal there is no difficulty in making an elephant bring its own fodder; besides a certain amount of saving in the maintenance of the animal, it will serve the still more useful purpose of enabling the animal to take some exercise daily. Young elephants between four and six years old should receive about 3 maunds of fodder, and about 3 to 5 seers of uncooked rice, a chittack of salt, and a small quantity of goor occasionally: the green stock of the paddy plant is the very best fodder for such an animal; failing this, they can be fed on sugarcane, *dāl* grass, and leaves and twigs of the gulher (*Ficus glomerata*) and jack-trees; on no account should they be fed on peepul, especially when it is throwing out new leaves. Elephants should be watered twice daily—once in the morning at about 9 A.M., and again at about 5 P.M. The cost of keeping a full-grown elephant, including the wages of a competent attendant, amounts to Rs. 30 to Rs. 35 per month, and that of a younger animal Rs. 20 to Rs. 25.

Transport.—A young elephant must not be made to swim large rivers, unless accompanied by at least one adult animal, and in charge of an experienced attendant. When conveyed by rail, it should be accommodated in a cattle waggon, and the attendant should travel with it, as otherwise the whistling, jolting, and the general commotion will frighten the animal greatly. When transported by ship, a suitable box may be provided, but in such a case the animal must be

accustomed to its use some time before, as it may refuse to enter the box at the last moment; a little enclosure may be built in some convenient place on deck, or it may be simply kept picketed; it soon becomes tame enough to be a general favourite with all hands on board. Such an animal should be habituated to dry food, such as hay, paddy straw, and compressed fodder; a liberal allowance of flour, rice, salt, and goor being also provided. Large elephants should be placed in the hold of the ship on a flooring made of sand or shingles.

TREATMENT IN SICKNESS.

The following are the chief causes of disease* :—

“Want of shelter from extreme heat and cold; excessive rain and storms of wind and rain; want of sleep; violence in the use of the “ankus” (driving hook), which induces a running of the eyes, turning into sore eyes; heating fodder, which also produces sore eyes; bark and leaves covered with bird’s dung, which produce spasms; the giving of gram when they are suffering from worms; exposure to the sun, which causes “sarza,” in which a tremor comes over the animal and he expires; neglect of elephant attendants as to food, which should be clean, wholesome, and sufficient; not being bathed daily during the hot season; overwork and bad driving.

“Elephants require but little sleep. When one has had enough to eat, and is not prevented by noise, want of room, or uneven ground, he will lie down before midnight; sleep for a couple of hours; get up and eat a little; and then lie down on the other side, rising finally two or three hours before daylight to finish his fodder. It takes a considerable time for him to satisfy the first cravings of hunger; and if the fodder be not given in time to enable him to do so by midnight, he will go on eating all night, and not lie down at all.”

The above remarks refer to adult elephants, but many of them also apply to younger animals.

In captivity elephants are frequently troubled with *worms* in the intestines; in this state they eat mud, which causes purging and the worms are expelled dead. The animal should not be bathed or fed upon rice, grain or salt until after all the worms are evacuated. If the purging continue, bamboo leaves should be given. Elephants sometimes suffer from *sore eyes*. If there is much inflammation, use solution of nitrate of silver (6 to 8 grains to an ounce); if there is only running, bathe the eyes with tepid water, and apply a little butter. For a white film in the eye, apply calomel dusting.

Very young and unacclimatized elephants are liable to attacks of a kind of glandular swellings known as *Zahr-bád*.

Symptoms.—“Glandular swellings behind the ear, under the throat, in the groin, or between either hind or forelegs; eyes become dull; trunk shrivelled, urine very red. *Treatment*.—Bleed $\frac{1}{2}$ lb. behind the ear; apply a strong blister of common blistering ointment mixed with sulphuric acid (1 drachm to the ounce), well rubbed into parts affected. If the swelling falls downward, the animal will recover, but the swelling in its downward course must be followed by the blister until it finally disappears. If behind the ear, it generally falls down the jaw, and disappears at the lip. If between the legs, it generally disappears at the knee-joint. If, instead of falling, the disease should spread, it will cause the death of the elephant, on the third day.*

* Notes by Captain H. Wilberforce Clarke, R.E.

A young elephant, about two years and six months old, died from this disease in 1877.

"Sukha, or dry Zahr-bād"—Is brought on by neglect, insufficient and improper food, want of cleanliness.

"Symptoms."—The animal pines away to a skeleton, becomes speckled, assumes a shiny grey colour, and tries to scratch itself on the legs. *Treatment.*—The animal is to be washed twice a day in clear water, well dried, and rubbed well with tillee oil (petroleum, when procurable) three times a week. The skin is in a very tender state, and should be protected from the sun, which will crack it; and from the rain, which will rot the scurf skin, and produce a state of intense rawness."

A young elephant, neglected by its former owner, was lately observed to have suffered from all the above symptoms.

OBSERVATIONS ON THE HABITS OF AN ELEPHANT.

The following is recorded of a young elephant which was sent to the Melbourne Zoological Garden in 1883:—"Its voyage was an adventurous one, as a terrific storm was encountered which cleared the deck of the ship, but the wise brute held on by its trunk to an iron bar on the leeside of the vessel until the storm abated." Elephants have been repeatedly observed to shed tears abundantly if forced to leave permanently their old home, associates, and surroundings.

(164) THE INDIAN RHINOCEROS.

(RHINOCEROS UNICORNIS—Linn.)

Hindi—*Genda, Genda*. Bengali—*Gandār*.

In this species the folds of the neck do not meet to form a saddle on the nape as in the next species, but curve backwards to join that on the shoulders; the base of the skull is broad; the hide, which is very thick and tough, is like an armour plate, and studded as it were with round-headed nails, especially at the folds. In adult specimens the upper lip is rounded off, but in young individuals it is produced to a point, which is particularly noticeable, as lately observed, while the animal is feeding, or in the act of seizing something. The ridge of the skull flat, and ears placed closer together than in the next species. There is no difference in the relative size of sexes, but the horn is smaller in the female. It is the largest known species of the Asiatic rhinoceros.

Hab.—At present the Indian rhinoceros is mostly confined to the Dooars to the east of the Teesta river, although specimens are now and then heard of or obtained from Nepal Terai and Assam. Formerly they had a wider range of distribution, being found in the Terai regions between the Himalayas and Ganges, and, according to Jerdon, from Rohilkund to Assam. Specimens are recorded from Purneah, Nepal Terai, Maldah, Gowhati (Assam).

LENGTH OF LIFE IN CAPTIVITY.

An adult female, which lived in this garden from 1878 to May 1880, had, previous to its arrival here, been living for upwards of forty-five years in a private menagerie.

(165) THE SONDAIC RHINOCEROS.

(RHINOCEROS SONDAICUS—*Desm.*)

The folds of the neck unite to form a distinct saddlelike plate on the nape; the upper lip is produced into a flexible point, which is semi-prehensile, as is best noticed when the animal is in the act of seizing a leaf or a twig; ridge of the skull somewhat elevated between the ears, which are placed further apart than in the preceding species. Antero-posteriorly, the head is longer than in *R. unicornis*. The hide is characteristic, and cannot be mistaken for that of any other species; this peculiarity is due to the shape, size, and distribution of the tubercles. Except on the back, they are distributed all over the body, and are set closely together, the interspaces between them forming a network of narrow channels. There are no tubercles on the back, but the skin is irregularly cracked.

Observations.—Some difference of opinion exists as to the relative size of this and the preceding species. As far as they have been observed here, the *R. unicornis* appears to be the larger animal of the two; a female of the *R. unicornis*, about eight years old, has been found to be larger than a female of *R. sondaicus* of more than seventeen years of age.

Hab.—Sunderbuns, Assam, Burmah, extending through the Malayan peninsula to Sumatra, Java, and Borneo.

LENGTH OF LIFE IN CAPTIVITY.

An adult female has been living in the garden since 1887; this animal also lived for about ten years in the menagerie of the late King of Oudh.

(166) THE HAIRY-EARED RHINOCEROS.

(RHINOCEROS LASIOTIS—*Slater.*)

Horns two; the anterior one, which is the larger, is placed on the nostril; the posterior is placed between the eyes, about 3 inches apart from the former: it is small and conical in form. Ears thickly fringed with long drooping hair, which is the most characteristic feature of this species; the upper lip is produced to a blunt point; the skin smooth and without tubercles, of a brownish grey colour; the groin and creases formed by the folds are flesh-coloured; lower parts of the sides of the body thinly covered with brownish hairs, which are abundant and woolly in young individuals; height at the shoulder 4 feet 6 inches.

Hab.—Chittagong and Tipperah Hills, Assam, and Burmah. Only a single specimen (the third specimen living in captivity) has as yet been obtained from the latter country.

LENGTH OF LIFE IN CAPTIVITY.

A female has been living in the garden since 1882.

(167) THE SUMATRAN RHINOCEROS.

(RHINOCEROS SUMATRENSIS—Cuv.)

Ears filled inside with short bristly hairs; margin not fringed with drooping hairs; the upper lip is almost rounded; the skin is coarse and dark, and the hairs short, bristly, and less abundant.

Hab.—The Malay peninsula and the islands of Sumatra, Java, and Borneo.

LENGTH OF LIFE IN CAPTIVITY.

From 1882 to 1889.

Observations.—Zoologists are yet undecided as to whether these animals (*R. lasiotis* and *R. sumatrensis*) belong to different species, or are mere varieties of the same; and it would not, therefore, be out of place to indicate the several points of distinctions which these animals present in their external characters when examined side by side.

The hairy-eared rhinoceros is bulkier in form than the Sumatran species, and has much heavier fore-quarters; besides, an adult *lasiotis* stands higher at the shoulder than an adult *sumatrensis*. A young female *lasiotis* and a pair of adult *sumatrensis* were acquired in 1882, and it was observed after about a year that the former stood higher at the shoulder than the male *sumatrensis*.

The ears of the *lasiotis* are shorter and placed further apart than in *sumatrensis*; the skull of the former is broader, that of the latter narrow.

The tail of the *lasiotis* is shorter and well tufted; that of the *sumatrensis* longer and covered with scanty, bristly, and straggling hairs.

The skin of the nape of the *lasiotis* is smooth, that of the *sumatrensis* slightly corrugated. In the former the neck fold commences from behind and below the level of the ear and passes downward to meet its fellow of the opposite side, but does not form a pendulous knot below; in the *sumatrensis* the neck fold terminates in a pendulous knot at the front neck.

TREATMENT IN HEALTH.

Housing.—For the health, growth, and comfort of a rhinoceros, it must have water and mud to bathe and wallow in, ample shade to protect it from sun, and a large piece of dry ground as a promenade. An enclosure 230 feet long by 116 feet broad, with a tank 160 feet in length and 50 feet in breadth, well shaded by trees and clumps of bamboos, has been found to answer for a couple of pair of rhinoceroses. The fence may be built of iron rail uprights, about 5 feet high, with 1 inch iron rods

placed horizontally about 6 inches apart, or it may be surrounded by a strong brick wall about 3 feet high, with 2 feet of strong iron fencing built above and into it. Under ordinary circumstances, a rhinoceros does not require a shed or house in this climate; but it is much better to anticipate emergencies and provide one: there may be exceptionally bad seasons, or an animal may require isolation and seclusion from sickness or other causes. Before placing two or more animals together, their temper and idiosyncracies should be watched; a pair of Sumatran rhinoceroses have been known to fight constantly with each other, the male generally being the aggressor. They had ultimately to be separated. This incompatibility of temper may, however, be accounted for by the weak state of the female's health ever since her arrival. On the other hand, a female *lasiotis* and a male *sumatrensis* agreed very well.

Food.—In its wild state a rhinoceros feeds exclusively on leaves and branches of trees, and, like elephants, requires a large quantity to fill its stomach. Of all kinds, it appears to like the jack-fruit leaves best, but they are costly, and sometimes not procurable at all; the best substitute for these are the gulher (*Ficus glomerata*) leaves; it also feeds on other species of fig leaves, but it is better to restrict it to jack and gulher as much as possible. In captivity the leaf diet is usually supplemented by soaked gram and bran; they must have salt every day, and a small quantity of goor every now and then.

Breeding.—On the 30th January 1889 a young hybrid (between *R. lasiotis* and *R. sumatrensis*) was born. Both the parents had been living in the garden since June 1882, and it is the second recorded instance of rhinoceroses breeding in captivity. On the evening of the 29th January the female (*R. lasiotis*) was noticed to be somewhat restless; she refused her usual rations of gram, bran and salt, though every now and then she browsed some leaves and branches. Early next morning, she was in acute labour pain, very restless, and after intense suffering of nearly an hour, she suddenly got up and the young one was born.

The mother took no notice of the young one, which looked more like a lump of animated clay than a young rhino. After about an hour and a half, and not until after several ineffectual attempts, it got up at last and began to look for nourishment, but evidently did not know where to find it. It was weak and very unsteady in its movements, and could not walk three yards without tumbling. At 1 P.M. the mother was fed on oatmeal gruel, and the young one on a quart of cow's milk. At 4 P.M. the mother had her usual food consisting of soaked gram and leaves, but the calf receiving no nourishment yet from the mother was fed a second time on cow's milk about 6 P.M. and again about 10 P.M. at night. During the course of the night the young began sucking the mother, and henceforth there was no necessity for artificial nourishment. The young animal was now very lively and playful, and was already inclined to explore the enclosure, but as the banks of the tank were, in some places, steep and rugged, a temporary fencing was erected to keep the mother and young one within bounds, and prevent the latter from tumbling down and injuring itself. Measures were taken to prevent visitors approaching near the enclosure, as the female evidently disliked being looked at by a crowd.

The body of the young animal at birth was covered with soft woolly hair; the skin was soft and of a pinkish brown colour, which is gradually becoming darker as the animal is growing, but still retains a pinkish suffusion. The growth and development of a young beast, bred and born in captivity, but suckled and reared by its mother, compare favourably with that of another, born in a wild state, but early weaned from its mother, and brought up under artificial conditions. The present young rhino is only two years and seven months old, but it has already attained such a development as to equal the mother in size and bulk. Its upper incisor teeth have not yet appeared, and it is still now and then observed to seek nourishment from its mother.

Transport.—A cage is indispensable for the conveyance of a rhino, young or adult; it must be made narrow, so as to prevent the animal turning round, but still broad enough to enable it to sit down; a strong plank cage, iron bound, should be preferred to one made of iron rods, as smoothness of the surface inside is desirable; the roof, and the upper part of the sides, about a foot deep, should be left open, with means of closing in bad weather; the back end of the cage should also have a space of about 6 inches left open below for cleaning; there must be sufficient opening at the front end of the cage to admit of the animal seeing everything and breathing open air; the feeding and drinking vessels being introduced through another opening below. A rhinoceros, intended for transport overland, should be habituated to hay and dry fodder. An attendant should always accompany such a valuable animal, especially if it is young.

TREATMENT IN SICKNESS.

Tetanus has been known to cause the death of an adult female *R. unicornis*. An autopsy being held, the uterus was found to be very much enlarged, and its thickened and hardened wall pressing against the nerves of the surrounding parts. If the disease is early detected, the animal should be freely purged and kept quiet in a perfectly dark room; various remedies have been suggested, but it is useless to mention any, as recovery can seldom be effected.

Inflammation of the lungs has been met with in a young *R. sondaicus*, the animal dying within twenty-four hours from the time of the development of the first symptoms.

Tuberculosis of the lungs and liver was found in an old *R. sumatrensis*; the animal must have contracted the disease long before its arrival, as in spite of careful feeding it gradually declined.

OBSERVATIONS ON THE HABITS OF RHINOCEROSSES.

Some rhinoceroses have been found to be very tractable, especially those caught young and reared in captivity; but, like other wild animals, their temper can never be absolutely trusted. Of the four species of Asiatic rhinoceroses, the *R. lasiotis* appears to be the tamest. They are all more or less fond of water and mud, but both the two-horned species have been observed to evince much greater liking for them than either of the two one-horned animals; the latter have seldom been

found digging holes in the same way as these two-horned animals. The *R. sondaicus* now living in the garden has never yet been observed to wallow in the mud, and although it has ready access to a large sheet of water, it does not resort to it as frequently, except during very warm weather, as the habits of the genus lead us to expect. The highest bliss of the two-horned species, on the other hand, is to lie undisturbed in a muddy hollow or in water, and for this purpose they are constantly digging new holes or undermining the banks of the tank, which at times have to be protected by piles and brickbats. They loosen the earth with the anterior horn, scraping and throwing it back with the fore feet, sometimes beating the lumps down to convert them into a soft ooze which they so much enjoy. They remain so quiet and still and thoroughly smeared with this liquid mud that it is sometimes difficult to detect their presence. When hungry and food is not forthcoming, the two-horned rhinoceroses call for it with a monotonous wailing whine; compared with the size, their voice is weak.

(168) THE MALAYAN TAPIR.

(*TAPIRUS INDICUS*—*Desm.*)

Description.—Externally, a tapir much resembles a pig, but is twice as large in size; anatomically, it is related to the rhinoceros on the one hand and to the horse on the other; it has four toes on the fore and three toes on the hind foot. Its most characteristic feature is the elongated snout, forming a short movable trunk; the colouring of its body is also peculiar, being greyish white on the back and sides, and black on other parts, the line of separation being distinct and well marked. It has a short tail and pointed ears, and its body is covered with short hairs.

Hab.—Malayan peninsula, Sumatra. It also inhabits Tenasserim, Lower Siam, Tavoy, and Mergui provinces.

LENGTH OF LIFE IN CAPTIVITY.

From 1882 to 1890.

(169) THE HAIRY TAPIR.

(*TAPIRUS ROULINI*—*Fischer.*)

Smaller than the preceding; of a dark brown or blackish colour; ears edged white; snout less elongate.

Hab.—High regions of the Andes.

LENGTH OF LIFE IN CAPTIVITY.

An adolescent specimen has been living since December 1890.

TREATMENT IN HEALTH.

Housing.—In their wild state tapirs live in the depths of shady forests in the neighbourhood of water, to which they frequently resort for swimming and bathing. In captivity they should have a large

shady enclosure with a tank. Their propensities for climbing low walls and fences have on several occasions been noticed; so that the enclosure should be built in such a way as to render climbing impossible, and for this purpose a wall about 5 feet high, with a deep projecting cornice, will answer; to enable the visitors to look into the enclosure, an embankment about 2 feet high should be thrown up round the outer aspect of the wall, and a footpath constructed along its top; the wall of the enclosure used for tapirs in this garden is only about 3 feet 6 inches high, surmounted by a light iron fencing built into the coping. It is, however, not every tapir that will attempt escape. A house in one corner of the enclosure is necessary, and it should be built of brick and mortar, as the animal is addicted to biting softer materials; the floor should be raised and dry, or a platform provided. Tapirs are generally inoffensive animals, and several of them, of the same or different species, may live together in peace.

Food.—Tapirs feed on vegetable substances, consisting of leaves, shoots and roots; they can be fed on jack-fruit and other leaves, sweet potatoes, yams, bran, and boiled rice; the latter may be given sparingly during the hot weather only.

Breeding.—A tapir obtained in January 1877 gave birth to a young one in the month of May following; another obtained in July 1883 calved in October of the same year. Both these animals were in possession of a dealer for at least three months prior to their inclusion in this collection, and had no opportunity of pairing; this must have happened while they were yet in a wild state before capture. Young tapirs are marked with brownish spots and stripes, like young of wild pigs. The spots and stripes disappear in about six months.

Transport.—In July 1883 three tapirs were shipped from Singapore in battened cages with open tops; two of these animals arrived wounded and lame; during the voyage they made frequent attempts to escape by climbing over the sides and biting through the woodwork of the cage. All tapirs do not of course behave in the same manner; but the above facts indicate the kind of precaution necessary for their transport.

TREATMENT IN SICKNESS.

An apparently healthy female died after having suffered for about three days from *obstruction of the bowels*. A *post-mortem* examination was held, and the animal was found to have been suffering from *tuberculosis of the lungs and liver*.

Galloping consumption.—Another female rapidly wasted away and died on the 30th October 1890. On an autopsy being held, both the lungs were found full of cavities, so that there was not a square inch of healthy tissue anywhere. Up to about the end of July of that year the animal was apparently healthy, but from about that time it rapidly began wasting away, developing at the same time other unmistakable signs of *consumption*.

Several cases of *prolapsus of the anus* occurred among the Malayan tapirs exhibited here. One of them, a young male, born in the garden, had to be operated upon under chloroform, as, gangrene

having set in, it was found necessary to remove a portion of the rectum; the animal, unfortunately, did not recover. The disease, however, generally yields to treatment if early adopted. The first and important thing is to gently and carefully reduce the prolapsus and introduce a suppository consisting of equal parts of powdered catechu and tannic acid, tied in a small piece of muslin, some anodyne being at the same time applied; frequent application of ice is also recommended: by way of diet the animal should be restricted to linseed meal and barley. If the case proves obstinate, besides the astringent suppository, anodynes and ice, sustained digital pressure should be applied, and for this purpose the animal should be confined within a small space. Perfect quietness should at all times be enjoined.

OBSERVATIONS ON THE HABITS OF TAPIRS.

Ordinarily tapirs sleep or remain indoors during the greater part of the day, becoming livelier towards the evening, when the time for feeding arrives; and if there is any delay in obtaining food at the usual time, it calls for it by uttering, every now and then, a squeaking note, peculiarly expressive of want. Their mental capacities do not appear to be susceptible of any training, so that they never become thoroughly tame or friendly, as might have been expected from their inoffensive nature. They are never aggressive, but if annoyed or enraged they are capable of inflicting severe wounds by biting.

They much enjoy bathing and swimming, and have sometimes been observed to remain under water for at least a minute. The locomotion of the hairy tapir is accompanied by much angular flexion of the joints, causing the limbs to be drawn up high at each footfall.

(170) THE WILD ASS.

(EQUUS ONAGER—*Pall.*)

Hindi—*Gorkhur.*

Description.—Height at shoulder 11 to 12 hands; above isabelline with a slight rufescent tinge; muzzle, breast, and the inner aspects of the limbs white; a dark chocolate colour median stripe extends from the mane to the tail; in some specimens there are dark cross stripes on the shoulder, and limbs faintly but distinctly marked. They vary somewhat in height; specimens now living in the garden, are about three years and six months old and less than 11 hands high; but animals of the same age have been found to be over 11 hands.

Hab.—The Punjab, Sindh, the deserts of Cutch and Rajputana, extending through Afghanistan and Beluchistan to Persia. The race of the wild ass is gradually becoming extinct.

LENGTH OF LIFE IN CAPTIVITY.

A little over five years.

(171) THE DOMESTIC ASS.

(EQUUS ASINUS—*Linn.*)

Both the Indian and African varieties have been exhibited.

(172) BURCHELL'S ZEBRA.

(EQUUS BURCHELLI—(*Gray.*))

Description.—Height at the shoulder 4 feet; robust and thick-set in form; mane and tail full; the ground colour of the body above pale yellowish; the limb and under parts nearly white; the stripes are brownish black; there are fainter and narrow stripes in the interspaces between the broad stripes; limbs without stripes; individuals are said to vary in this respect, some being striped almost down to the hoof; the greater parts of the ears are white; a ventral black stripe runs along the median line, and to which the large side stripes unite by their lower ends; there is also a dorsal stripe; the head and face are beautifully marked by narrow black lines. The ground colour of the body has been observed to vary in shade at different seasons of the year.

Hab.—South Africa, extending northwards to Kilimanjaro district.

LENGTH OF LIFE IN CAPTIVITY.

An adult female has been living in the garden since May 1889.

TREATMENT IN HEALTH.

Housing.—Both the wild ass and the zebra should have well-drained, dry situations for their habitation. Their principal requisites are—a sheltered shed, a sleeping room, and an enclosure as a grazing ground. The floor of the shed and the sleeping room should be made of bricks laid on edge, and joints cemented. Any partition or wall necessary for the shed should be made of planks or bricks; iron or wire fencing with interspaces should, as much as possible, be avoided. These animals are much given to frisking and kicking against anything, and serious consequences may happen if the above precautions are neglected.

Food.—Crushed food, consisting of gram, oats, Indian-corn, and bran; hay, paddy-straw, and salt. During the wet weather the grazing ground should be frequently mown if the growth of fresh grass is luxuriant, as otherwise they may get colic from overfeeding on green grass.

Transport.—Boxes for the conveyance of these animals should be narrow, perfectly plain inside, and provided with doors at both ends.

TREATMENT IN SICKNESS.

Both the wild ass and Burchell's zebra suffered from *rheumatism*, no doubt brought on by dampness of the floor of their habitation. The zebra had frequent attacks until a platform about 18 inches high was provided. From causes alluded to under *housing*, the wild asses suffer sometimes from *wounds* and *sores*; in themselves they may not be serious, but as swarms of flies are about, the danger of their getting fly-blown and breeding maggots should be guarded against. For surface wounds nim oil is very good, but for deeper ones a dressing composed of stockholm tar, softsoap, sulphur and carbolic acid should be used.

OBSERVATIONS ON THE HABITS OF THE WILD ASS AND ZEBRA.

The wild ass, unlike its domestic congener, is an intractable animal, very shy and difficult to approach. Attempts have been made to break them in, but without success. A fine adult male once ran amuck and "in a state of temporary *furor* ran against the iron railing of its compound with great violence and thus fractured its skull." The zebra is an equally intractable and untameable animal, addicted to kicking and biting; but from what has been observed of the specimen (*E. burchelli*) it does not appear that they are altogether devoid of sociable qualities. This animal was at first shy and vicious, but it has gradually become so tractable as to allow itself, with a little coaxing, to be groomed and rubbed, and if in good humour it comes to the side of the fencing to be stroked and patted. Its call-note is a ringing musical bellowing, somewhat like that of the swamp deer (*C. duvauceli*), but uttered more quickly and less prolonged. The most characteristic peculiarity is the periodicity of the call, which may be heard at an interval of half an hour or more for two or three days once every month or a month and a half.

(173) THE DOMESTIC OX.

(BOS TAURUS—*Linn.*)

(174) THE ZEBU.

(BOS INDICUS—*Linn.*)

Both the above species, which are now only found in a domesticated state, have been represented in this collection.

(175) THE GYAL, OR MITHAN.

(BOS FRONTALIS—(*Lambert.*))

Description.—Height at the shoulder 4 feet 6 inches to 5 feet; heavy in build; general colour varies from black with a coffee brown shade to dark brown; legs from knee downwards white; dewlap well developed; tail short; horns short, very nearly straight (extent of the curvature upwards varies in different specimens); colour of the horns greyish black; in older animals they are very rough and somewhat scaly at the base; forehead very slightly depressed, and of a greyish brown colour; there is no ridge in the median line of the skull between the horns. The aspect of the skull is markedly triangular.

Many intermediate forms of gyls, including hybrids between it and the domestic cattle, have also been exhibited. The white in the legs, so characteristic of a pure gyal, is either wanting or imperfect in these; the forehead in some is altogether white or blotched with white spots; the horns are sometimes rounded and more curved than in a pure gyal; others have almost straight and flat horns, and the ridge on the anterior part of the back is much less prominent; in the hybrids,

between the gyal and the domestic cow, this ridge is altogether wanting, and the back is remarkably straight, resembling some of the best breeds of English cattle.

Hab.—The hill regions of Assam, Tipperah, and Manipur, extending through the Chittagong Hill Tracts and Arracan to Akyab; also found in the Duffla hills north of the Brahmaputra. Gyals of indisputably pure breed have been obtained from Hill Tipperah and the Naga hills; other specimens, of which the purity is doubtful, have been obtained from the Chittagong Hill Tracts, Lushai hills, the country of the Abors in the hill regions of Assam, Cachar, &c.

LENGTH OF LIFE IN CAPTIVITY.

From 1876 to 1884.

(176) THE SONDAIC OX, OR BANTENG.

(BOS SONDAICUS—(Müll.))

The banteng is readily distinguished from the gyal by its yellowish brown colour with a chestnut tinge and the white rump; the ridge on the anterior portion of the back is much less developed than in either the gyal or gaur; tail long; dewlap moderate; horns smaller, and more rounded and curved than in the gyal. A fully adult male is a much darker animal than when it is young or adolescent.

Hab.—Burmah, Malay peninsula, the islands of Java, Borneo, and Bali; it is said to occur in Arracan also.

LENGTH OF LIFE IN CAPTIVITY.

From October 1881 to March 1888.

(177) THE GAUR.

(BOS GAURUS—Trail.)

Description.—An adult gaur is a much larger animal than a gyal or banteng, standing nearly 6 feet high at the shoulder; it is more slender in build, but robust and compact; general colour dark chestnut brown; legs white, as in the gyal and banteng; the ridge on the anterior portion of the back is much elevated, and the back arched; there is a conspicuous ridge in the middle of the skull between the horns; the forehead is depressed; there is no dewlap.

Only juvenile and adolescent specimens have been exhibited.

Hab.—Southern and Central India, extending through the Central Provinces and Chota Nagpore to Orissa and Midnapore, the Nepal and Bhutan Terai, Assam, Tipperah and Chittagong hills, extending southwards through Arracan and Burmah to the Malay peninsula.

LENGTH OF LIFE IN CAPTIVITY.

From 1881 to 1885.

TREATMENT IN HEALTH.

Housing.—The banteng is such a tractable animal that it may, if necessary, be treated like a domestic cow, both with regard to *housing* and *feeding*; but the gyal, though it also becomes equally tame after a few days in captivity, will not thrive in the climate of Lower Bengal unless much freedom and pasturage are allowed. A gyal calf obtained in 1876 showed, during its adolescent stage, signs of wasting away despite good feeding and treatment; but on being allowed the freedom of grazing for itself, for the greater part of the day, in an adjoining pasturage, where there was a fine avenue of trees, the animal quickly recovered and developed into a fine bull. Though heavy and powerful animals, neither the gyal nor the banteng are mischievous, and can easily be accommodated in ordinary deer paddocks; but shade and coolness are indispensable for them, especially during the hot weather; stalls should be provided to protect them from the vicissitudes of climate. Only young and adolescent gaurs have been exhibited in this garden, and the following observations recorded in respect to the rearing of a young animal may be useful:—"As all previous attempts at rearing gaurs in confinement had signally failed, this calf was allowed to roam through the gardens even to the detriment of the plants, and being a shade-loving animal, frequenting the densest forests, the instincts of the little creature led it to seek seclusion and shade in the centre of the most choice groups of shrubs. This freedom conferred upon it, however, no doubt kept it alive, and even now, when about two years old and a large animal with formidable horns, it is still so tractable that it is permitted to wander about the gardens for a few hours daily." In allowing this freedom the temper of the animals should be taken into consideration, and an attendant should watch their movements, which should be restricted within certain limits.

Food.—Newly-imported gyals eat nothing but grass and bamboo leaves, but as they gradually become reconciled to their altered state of life, they begin to relish other food also, such as gram, bran, hay, &c.; bamboo leaves are always acceptable to them, and no efforts should be spared to supply these as frequently as possible; salt is very necessary for them, and should be given daily either mixed with grain or in small lumps for licking; a small quantity should be mixed with the food to make it more palatable. A few onions should be given with gram or bran. A large troughful of clean water should always be kept in a shady place, and the scouring of the vessel daily and scrupulously attended to, as otherwise the slime that adheres to it finds its way into the animal and causes disease.

Breeding.—Gyals have yielded fine hybrids between themselves and the domestic cattle; the points in which the progeny differed from both the parents have been already indicated; these hybrids were mostly cows, and they bred with the English and country bulls. Bantengs have also bred in the garden.

Transport.—Gyals and bantengs intended for transport overland should be gradually weaned from green food and fed on hay and compressed fodder, supplemented by grain. As they are generally harmless and tractable animals, no box is necessary, but a hurdle enclosure may be provided. The best time to ship them to Europe is

between April and June; and to Australia from November to February. With regard to their transport inland, it is important to remember that the climate of Lower Bengal is uncongenial to gyaals (it is unnecessary to say anything about the gaur, as they are so seldom acquired) which, if possible, should be brought down to the plains during the winter and rains only.

TREATMENT IN SICKNESS.

Either during the transit or after a few days in the plains, gyaals generally become subject to *diarrhoea*. Change of climate, hardship and discomfort of the journey bring it on. Restrict such animals to bamboo leaves alone, and they will soon recover. Some of them linger and die. New arrivals, especially those that have been on board an inland vessel for a length of time, during their passage from Assam or Cachar to Calcutta, and confined more or less to dry food, when turned loose in a grassy paddock, begin to eat greedily, and soon gorge themselves with green grass. The stomach becomes much distended, and its action suspended as it were; fermentation in the meantime sets in, and as the gas accumulates, the distention becomes excessive and painful. In really bad cases the animal becomes restless, breathes with difficulty, and manifests pain by its groans; the eyes become much congested. The most effectual treatment is to puncture the side, about 9 inches from the last rib and lumbar vertebra to allow the accumulated gas to escape. The operation is easy, and a sharp pointed, stout gunny needle is enough to perform it with, if a trochar is not handy. Immediately after the operation, half an ounce of aromatic spirit of ammonia and two ounces of tincture of ginger, or 4 ounces of juice of raw ginger, in a pint of warm water should be administered. For at least two days the animal should be fed on linseed meal, chopped hay, bran, and other food, and for some time afterwards its allowance of green grass should be sparing. In milder cases, where the symptoms are not such as to bode immediate danger, one pound of sulphate of magnesia, one ounce of aromatic spirit of ammonia, and two ounces of juice of raw ginger, in about a pint of tepid water, have been administered with good result.

Innumerable *parasites*, about $\frac{3}{8}$ of an inch long and of a reddish brown colour, were found in the stomach of a gyal, which died within a few months after its arrival in Calcutta. This animal never recovered from the debilitated condition in which it came, and gradually dropsical swellings about the lower jaw and feet appeared.

Rinderpest—Has now and then broken out, and done havoc amongst the cattle, deer, and sheep. Though generally of a virulent and contagious character, the symptoms and the period of its duration varied.

The following appearances were observed on opening the body of one of the victims (a banteng calf) some three hours after death:—

Lungs, liver, kidneys, spleen and heart healthy; no ulceration in the stomach or small intestines; ulcerated patches present here and there in the large intestines; larynx and trachea extensively congested; trachea full of frothy and sticky mucus.

In order to save the parent bantengs with another calf about four months old, which were already segregated, they were sent over to,

and lodged in, the Royal Botanical Gardens, Sibpur, on the other side of the river. Here they lived happily and bred. The elder surviving calf died after about a year and a half from the same disease. Two years and seven months after their removal, the bantengs with the remaining calf were brought back, but they all died during the course of the next month and a half. It appears that the germ of the disease had already entered into their system, and that it took such a long time in developing was probably due to the change.

Several gyls also have succumbed to the same disease.

It has been observed that whenever there is a cattle plague in the neighbourhood, the outbreak spreads itself in more or less severe form among the cattle, sheep, and deer in the garden.

OBSERVATIONS ON THEIR HABITS.

Both the gyal and banteng are, as already mentioned, very tractable animals, but they are all retiring, without being shy. Only young gaurs have been exhibited here, and although one of them attained a good size and proportion, it was never found to be fierce. This was probably due to its having been brought up from infancy. The perspiration of the gyal and gaur is phenomenal. No other animal has been observed to perspire so profusely as do these animals. In the gyal it is thick and hardens into minute pellets.

(178) THE AMERICAN BISON.

(BISON AMERICANUS—(*Gmel.*))

A single female was obtained in December 1887, but it came in such a sickly state that it did not survive long.

Hab.—North America.

(179) THE YAK.

(PÖEPHAGUS GRUNNIENS—(*Linn.*))

Hab.—The mountains of Central Asia and the higher regions of Chinese Thibet.

A pair of these animals were exhibited for a few days while awaiting transmission to the Zoological Society's Garden, London. Yaks are extremely intolerant of heat, and it is therefore better not to attempt bringing them down to the plains.

(180) THE CAPE BUFFALO.

(BUBALUS CAFFER—(*Sparr.*))

It is smaller in size than the typical wild buffalo of India, which is a gigantic animal; the horns are short but very thick, and

approximate each other on the forehead, where they form a rounded prominence.

Hab.—South Africa.

LENGTH OF LIFE IN CAPTIVITY.

A specimen lived for about three years, and died from the effects of an accident.

(181) THE INDIAN BUFFALO.

(BUBALUS BUFFELUS—(*Blum.*))

Domestic variety.

(182) THE ANOA.

(ANOA DEPRESSICORNIS—(*H. Smith.*))

It closely resembles a young buffalo; colour rusty black; short prismatic horns are directed upwards.

Hab.—Celebes.

LENGTH OF LIFE IN CAPTIVITY.

One of the specimens obtained in 1880 lived for about eighteen months only.

TREATMENT IN HEALTH.

Housing.—The Cape buffalo will do well in an enclosure similar to that recommended for the tapir; if kept in a paddock, the fencing needs to be stronger than that ordinarily used for ruminants. The anoa is a shade-loving animal, and should not be placed in an exposed situation; if lazy, it should be made to take exercise.

Food.—Grass and grain; the anoa is fond of the green stalks of paddy plants.

OBSERVATIONS ON THE HABITS OF THE CAPE BUFFALO AND ANOA.

The specimen of the Cape buffalo exhibited here did not appear to care much for water like its Asiatic congener, the Indian buffalo. The anoa is listless and lazy.

(183) THE ELAND.

(OREAS CANNA—(*H. Smith.*))

Description.—Height at the shoulder nearly 5 feet 6 inches; colour uniform tawny yellow, with slaty-grey shades. It is, however, subject to great variations, some having distinct faint stripes, others without

them. It has straight black horns, and a dewlap. The males have tufts of hair on the forehead and a mane on the neck. It is the largest of all the existing antelopes.

Hab.—Southern and Eastern Africa.

LENGTH OF LIFE IN CAPTIVITY.

A specimen lived from December 1882 to August 1885. It died of rinderpest.

(184) THE NILGAI.

(BOSELAPHUS TRAGOCAMELUS—*Pall.*)

Nilgai is a vernacular term, meaning blue cow. The animal is well known in India.

Hab.—It is found throughout the plains of India, from the Punjab to Cape Comorin; not found in Lower Bengal.

LENGTH OF LIFE IN CAPTIVITY.

From 1877 to 1885. In the latter year most of the ruminants died from rinderpest.

(185) THE BEISA ANTELOPE.

(ORYX BEISA—(*Rupp.*))

Description.—As large as a domestic ass, but extremely handsome in build and shape; general colour of the body brownish grey, with well-defined black bands down and across the face, on the back, and along the sides and the limbs; the black bands on either side of the body unite on the breast, and continue as a single band to the lower jaw, here they divide to form transverse bands on the head; it has a short black mane and a long tufted tail; horns are long, slender, straight, or somewhat recumbent, and pointed.

Hab.—Abyssinia and the coasts of the Red Sea.

LENGTH OF LIFE IN CAPTIVITY.

From 1879 to 1886.

(186) THE LEUCORYX.

(ORYX LEUCORYX—(*Pall.*))

It is smaller than the preceding species, of a uniform whitish grey colour, with curved horns.

Hab.—North Africa.

Being on deposit, was on view for a few months only.

TREATMENT IN HEALTH.

Housing.—The eland is a bardy animal, and may be housed like a nilgai or blackbuck. Beisa antelopes have been found to be rather delicate, and care should be taken not to expose them to damp and moisture; they also require better protection during the nights in winter.

Food.—They thrive well on mixed food consisting of gram, bran, Indian-corn, wheat, paddy, &c., supplemented by hay and green grass, which should be given sparingly; they are not accustomed, in their wild state, to green grass, and it is important that their grazing ground should be frequently mown during the rains to keep down the growth of grass.

Breeding.—Beisa antelopes have twice bred in the garden. Young nilgai, both male and female, are fawn colour; the males begin to assume the bluish grey colour when about one year old.

Transport.—The travelling cage for a Beisa antelope should have its front elevation higher than the back end, and the inside padded. In fact the travelling cage for all horned animals should be made on the same principle.

TREATMENT IN SICKNESS.

The eland, as already mentioned, died of *rinderpest*. The good effect of segregation and change of place upon animals apparently unaffected, but in close proximity to others affected by contagious diseases, has already been noticed in connection with the bantengs (pages 142-43). The same beneficial result attended the removal of the Beisa antelopes to a place some sixteen miles down the river. Here they lived in perfect health from July to December 1885. About a year afterwards one of these animals fell a victim to a second outbreak of the same disease. A young beisa, which arrived on May 25th, 1878, was found dead the next morning. It was placed in a shed inside a nice little enclosure; after a voyage of nearly a month, the fresh crop of grass was very tempting to the beast, which gorged itself, and died from excessive distention of the stomach (see page 142).

OBSERVATIONS ON THE HABITS OF ELAND AND BEISA ANTELOPES.

The following is recorded about the habits of elands in a wild state:—"In its natural condition," continues Sir Cornwallis Harris, "the eland frequents the open prairies and the low rocky hills interspersed with clumps of wood, but is never to be met with in a continuously wooded country. Rejoicing especially in low belts of shaded hillocks, and in the isolated groves of *acacia capensis*, which, like islands in the oceans, are scattered over many of the stony and gravelly plains of the interior, large herds of them are also to be seen grazing like droves of oxen on the more verdant meadows through which some silver rivulet winds in rainbow brightness betwixt fringes of shining bulrushes."—*Sir Cornwallis Harris, quoted by Selater.* The male beisa antelopes exhibited here have invariably been found to be pugnacious animals but when provoked the female is as formidable to encounter as the male

In captivity they have never been found to be shy or suspicious, and if well treated become to a certain extent tame. The male nilgais are also generally vicious animals; they have been observed to kneel down when about to fight or attack a man; they often assume the same attitude while feeding.

(187) THE ARABIAN GAZELLE.

(GAZELLA ARABICA—(*Hempr. et Ehr.*))

Horns not lyrate; females possess horns.

Hab.—South Arabia.

Observations.—Gazelles are small, slender, elegant shaped, and sandy coloured ruminants. The males of all the known species, and the females of most, possess horns. White or whitish bands extend from the base of each horn down to the upper end of each nostril; abdomen white, bounded by dark stripes on the flanks; the rump, and in some cases the haunches, also white.

(188) THE INDIAN GAZELLE.

(GAZELLA BENNETTI—(*Sykes.*))

Hindi—*Chikârâ*.

Hab.—Throughout the western parts of India, extending westward through Beluchistan to Persia.

(189) GRANT'S GAZELLE.

(GAZELLA GRANTI—*Brooke.*)

The white of the rump extends on to the haunches; horns larger than in any other species. In the male exhibited here they measured 19 inches. They much resemble those of the chikara (*G. bennetti*), but are much larger.

Hab.—Eastern Africa.

LENGTH OF LIFE IN CAPTIVITY.

Gazelles do not thrive in Lower Bengal. A male Grant's gazelle lived the longest from 1881 to 1886.

(190) THE INDIAN ANTELOPE.

(ANTILOPE CERVICAPRA—(*Linn.*))

Hindi—*Harna* ♂, *Harnin* ♀. Bengali—*Kalsanr*, *Krishnasar*.

Description.—The upper parts of a fully adult male are glossy black, the area round the eyes and a small portion of the muzzle white or brownish white, the shade and extent of the colour is variable; the under

parts and inside of the limbs white; young males are of light fawn colour like the does, but they gradually become darker; the horns large, black, and spirally twisted and annulated to about an inch from the tip; females have no horns as a rule; a horned doe was once received and exhibited for some time; these horns, quite unlike those of the males, were smooth, somewhat flattened and curved backward, and did not exceed 9 inches in length. Light coloured adult males are not uncommon. The tear glands below the inner angle of the eyes are prominent.

Hab.—Found throughout the plains of India from the foot of the Himalayas to the extreme south of the peninsula, with the exception of the Malabar Coast, the Eastern Ghâts, and Lower Bengal. It is also recorded to have been observed at Gowhatty and on the banks of the Brahmaputra. Most abundant in the North-West Provinces, the highland of Central India, and the Deccan.

LENGTH OF LIFE IN CAPTIVITY.

Specimens lived from 1876 to 1884, and prior to their inclusion in this collection a few years in a private menagerie.

(191) THE FOUR-HORNED ANTELOPE.

(TETRACEROS QUADRICORNIS—(Blainv.))

Hindi—*Chousingha*.

Description.—About the size of an Indian gazelle; colour reddish brown; fetlocks marked white like those of the nilgai; hair coarse; males only furnished with horns: in adult animals the upper pair is about 3 to 4 inches long, the lower pair much smaller, sometimes quite concealed by the hair; the aspect of the forehead is very convex.

Hab.—Generally distributed throughout the greater part of India, especially abundant in Central Provinces; not found in Lower Bengal.

LENGTH OF LIFE IN CAPTIVITY.

About four years.

(192) THE BUBALINE ANTELOPE.

(ALCELAPHUS BUBALIS—(Pall.))

Description.—About the size of a nilgai; head narrow and elongated; the body falling away behind; colour uniform bay; the horns, which are annulated about two-thirds of their length, are directed upward in a lyrate form, and then abruptly turned backward.

Hab.—North Africa.

LENGTH OF LIFE IN CAPTIVITY.

A specimen lived from July to December in 1881; death being caused by an accident.

TREATMENT IN HEALTH.

Housing.—As gazelles and antelopes are denizens of dry regions, they should be accommodated in well-drained paddocks free from damp and moisture; to ensure this, if the soil is not sandy, a thick layer of coarse sand, about a foot deep, may be laid, with a top dressing of earth, to allow some grass to grow, which should be sparse at all times. Antelopes are not particularly susceptible to the depressing influence of the wet weather, but gazelles are; and care should therefore be taken to secure them perfect protection from rain and wet. The floor of the shed should be built of masonry, and a layer of coarse sand should be sprinkled over it, and in order that the animals may be kept indoors when necessary, it should be enclosed with planks on three sides, with battens or iron fencing in front. Light sheds may be built of teak wood posts with plank roof, covered over with sheet iron or zinc. New arrivals should not be exposed for exhibition.

Food.—Gram, bran, Indian-corn, paddy, wheat, &c., hay, onions, and salt. Gazelles are very fond of babul leaves (*Acacia arabica*); green grass should be sparingly given to them during the wet weather.

Breeding.—Gazelles, black bucks, and four-horned antelopes have bred in this garden and reared young ones successfully.

Transport.—The travelling cage for these animals should be made, like that of any other ruminants, with planks on three sides and battens on one, but wide enough to allow them to turn round; the bubaline antelope may be treated like an eland in this respect.

TREATMENT IN SICKNESS.

Inflammation of the lungs is a common complaint among gazelles during the rains and winter; they have also been known to suffer from, and die of, *diarrhoea*. A doe of an Indian antelope was once suspected to be suffering from *consumption*, and on being treated with phosphate of lime it completely got rid of its hoarse cough, and regained its former plump and sleek condition. A hog deer once ripped open the side of a four-horned antelope, causing a portion of the intestine to protrude; although the case was considered hopeless, owing to the difficulty of keeping the beast quiet, the protrusion was reduced and the opening stitched with carbolised catgut ligature, and the wound dressed antiseptically, and all possible precautions taken to keep the animal, which was absolutely tame, quiet and in one posture. The antelope recovered in about twenty days, and lived in perfect health, until some two years afterwards it was killed one night by some pariah dogs. The bubaline antelope dropped down suddenly dead one afternoon; as the animal was in perfect health a careful autopsy was held, and its vertebral column was found to be fractured; the cause of the accident was never ascertained.

OBSERVATIONS ON THEIR HABITS.

Gazelles are lively, active, playful creatures, but extremely shy and wary, unless rendered tame and familiar in captivity; the females have invariably been found to be gentle and inoffensive, but some males are

pugnacious and charge with much skill and courage, moving a few steps backward, and coming forward with a light spring. Like the Indian antelopes, they also, though not so often, bound high in the air, and if closely observed at this instant the feet will be found drawn closer together. The Indian antelope is perhaps more wary than a gazelle, and is very suspicious of strangers and strange surroundings; but if taken young and reared in captivity, it becomes very tame and confiding; most of the adult bucks are pugnacious, especially during the breeding season, and fight much between themselves; and at this season they may be seen chasing the does round and round the enclosure.

(193) THE DOMESTIC GOAT.

(CAPRA HIRCUS—*Linn.*)

The following varieties have been exhibited:—

The Kashmir goat, famous for its long and fine wool; the Welsh, Maltese, and Lushai goats.

(194) THE PERSIAN IBEX.

(CAPRA ÆGAGRUS—*Gmel.*)

Description.—Height at the shoulder about 3 feet; colour of the body above yellowish grey, white below; the yellowish shade fades away in captivity; beard black; the horns of the male are large, curving upward and backward and gradually diverging from each other; a series of protuberances and transverse depression on the convex surface give it a ringed appearance.

Hab.—"Found in Crete and several other of the wilder islands of the Ægean sea, in Asia Minor, on the Taurus, Mount Ararat, and the Little Caucasus, possibly extending to the southern slopes of the Great Caucasus. It is found all over Persia, Transcaspia, Afghanistan and Beluchistan, and extend to the borders of India, where it is found in the Pabb and Suliman ranges in Sind, and probably north to the Khyber Pass."—*Notes on Indian Horned Game by W. L. Slater.*

LENGTH OF LIFE IN CAPTIVITY.

Over three years.

(195) THE DOMESTIC SHEEP.

(OVIS ARIES—*Linn.*)

The following varieties have been exhibited:—The four-horned ram from Arabia; fat-tailed breed from Asia Minor and Afghanistan; the fat in this breed is deposited under the tail instead of under the skin; the south down sheep with short and close-set wool and dark-brown face and legs.

(196) THE PUNJAB WILD SHEEP.

(OVIS CYCLOCEROS—*Hutton.*)Hindi—*Uryal* in the Punjab.

Description.—A full-grown male stands about 3 feet at the shoulder; general colour of the body varies from reddish brown to brownish grey; sides of the mouth, chin, abdomen, and legs below the knee white; blackish patches on the sides and limbs; beard black; the eyepits large; horns resemble those of a domestic ram, attaining a length along their curvature of nearly 36 inches in fully adult males, and much annulated; the female is somewhat small, has no beard, horns small, and colour lighter.

Hab.—Found in the Punjab salt range; the Suliman range in the neighbourhood of Peshawar; in Beluchistan and Afghanistan; also found in Persia and Transcaspia. The uryal inhabits much lower elevations and hotter regions than most of the known species of sheep; which, as a rule, are only found at high altitudes, and in a cool atmosphere.

LENGTH OF LIFE IN CAPTIVITY.

From January 1879 to August 1883.

(197) THE BURRHAL WILD SHEEP.

(OVIS NAHOOR—*Hodgs.*)

Known as *Burrhal* throughout the Himalayas.

Description.—Height of an adult male 30 to 36 inches; colour, a light slaty blue, with shades of pale fawn here and there; under parts yellowish white; nose, front aspect of the limbs, a band along the sides, the chest and the tip of the tail black, which varies in intensity. Horns rounded, directed upwards and outward with a semicircular sweep; surface rough, but not much wrinkled. The female is smaller, with small slightly curved horns.

Hab.—The lofty ranges of the Himalayas, from Ladak to Bhutan; it is never found at lower elevations than 10,000 feet.

LENGTH OF LIFE IN CAPTIVITY.

It does not thrive in the climate of Lower Bengal, and is therefore seldom exhibited. A specimen lived for about eighteen months.

TREATMENT IN HEALTH.

Housing.—Enclosures and sheds similar to those recommended for gazelles will answer for ibex and uryal, with this modification, that in the present case the fencing needs to be higher, as both these animals have been known to jump over fencing and wall 6 feet 6 inches high with ease. When any portion of an enclosure is formed of a wall, its surface should be perfectly smooth, as the least projection in the shape of a moulding or an inclined buttress will give these sure-footed animals a foothold,

and they will bound on to the top in an instant. But however good the accommodation may be, they will never thrive in captivity in Bengal unless much freedom is allowed them to roam about. Much attention should be paid to the bodily cleanliness of the domestic sheep, as otherwise dirt adhering to the coat will irritate their delicate skin and cause sores to break out; and for this purpose they should be frequently washed with soap and water and the skin rubbed dry, and at least twice sheared during the hot weather. As they mostly come from cooler regions, they would prefer a thin coat and frequent baths.

Food.—The domestic goats should have some leaves and herbs every day, besides the ordinary food consisting of grains, &c., allowed them in captivity. If allowed liberty the ibex and urial will pick up much of their own food; they are very fond of rose leaves, both dry and green; in fact they thrive better on various kinds of leaves and hay than on grain: they should have ready access to lumps of rock salt at all times.

TREATMENT IN SICKNESS.

Diarrhœa is the common complaint among these animals, generally brought about by the effect of climate and improper feeding; many of them have, at one time or another, been affected by and fallen victim to *rinderpest*.

The habits of these animals have been already mentioned.

(198) THE GIRAFFE.

(GIRAFFA CAMELOPARDALIS—Linn.)

This most striking animal is characterized by its long neck and limbs, the sloping back, and its frontal appendages consisting of a pair of short, erect bony processes placed over the junction of the frontal and parietal bones, and covered externally with hairy skin; anterior to these is another bony eminence in the middle line of the frontal bone also covered with skin, and is spoken of as a third horn: these processes are present in both sexes. Ears are large; lips thin, mobile and somewhat produced; tongue long and semi-prehensile; tail long and well tufted; the ground colour of the body pale brownish chestnut, with large blotches of a darker tint; the under parts and the limbs below the knee uniform pale; height of a full-grown male about 16 feet; that of a female about 14.

Hab.—Africa south of the Atlas.

LENGTH OF LIFE IN CAPTIVITY.

From December 1877 to April 1887, the death being the result of an unfortunate accident.

TREATMENT IN HEALTH.

Housing.—The principle of accommodation should be the same as in the case of a zebra, with such modifications of detail as the size and the characteristic structure of the animal require; it is very delicate and

susceptible to vicissitudes of weather, so that cold draughts and damp should be scrupulously avoided.

Food.—Indian-corn, gram, wheat, &c., crushed and mixed together, or given separately as a change from one to the other: 2 to 3 seers of grain, a pinch of salt twice daily, supplemented by a few bundles of hay, will satisfy a full-grown animal; it is very fond of *babool* (*Acacia arabica*), and *beir* (*Zizyphus jujuba*) leaves; if quantities of these are available, the allowance of grain may be reduced. To enable the animal to feed and drink with ease, both the feeding and drinking vessels should be suspended high.

TREATMENT IN SICKNESS.

A male giraffe was found dead one morning in December 1879; the opinion was divided whether the animal died of *colic* or *inflammation of the lungs*; the suddenness of death, and the extremely distended condition of the stomach, full of half-digested food, supported the former conclusion; the nature of the accommodation, consisting of a thatched shed with thin mat wall and low mud floor, had probably brought on a chill inducing inflammation of the lungs.

OBSERVATIONS ON THE HABITS OF A GIRAFFE.

The giraffe is timid and peaceable in disposition; it soon becomes trustful and follows a keeper or anybody who offers it a morsel of food. Its thin and mobile lips and long and semi-prehensile tongue are ever ready to pick up anything in the way; the animals here exhibited showed greater preference for ladies' bonnets and delicately dressed and curled white muslin sheets which loosely dangle from Indian gentlemen's shoulders. Though timid and inoffensive, it is nevertheless capable of inflicting serious and even fatal injuries by kicking with its powerful limbs; a female giraffe was once noticed to behave in a manner which betokened mischief. To improve and adjust the drainage of the giraffe's enclosure, the paddock was entered: the animal was so tame, trustful and familiar that nobody thought anything about its presence. As soon, however, as it saw the working party, consisting of an overseer, a cooly with instruments, and the keeper, enter, it came cantering up and chased the former nearly round the enclosure, and repeated the same manœuvre an hour afterwards when the attempt was again made. The giraffe has a rocking motion when walking, and it is given to swinging its long neck every now and then, sometimes describing a complete figure of 8. Another peculiarity of the animal is that, when walking, the fore and hind leg of the same side move together. It is easily frightened, and has been known to clear a fencing 5 feet 9 inches high. While living in an enclosure which formed one of a series of deer paddocks, some pariah dogs got in one night, frightened the deer, and chased them about in all directions; the result was a general commotion among the cervine family; this so much frightened the giraffe that it jumped over the fencing and took flight; next morning it was found in a remote corner of the garden, quietly sitting in the midst of a dense shrubbery. A most lamentable catastrophe happened to a fine giraffe

which accidentally hung itself in the fork of a tree. It was nibbling at the lower leaves, and in order to reach some on a higher twig evidently attempted to raise itself on its hind limbs by resting the forefeet on the trunk, but slipped and fell on its side, and was instantly strangled.

(199) THE INDIAN MUNTJAC.

(CERVULUS MUNTJAC—*Zimm.*)

Hindi—*Kākūr*.

Hab.—Found all over India, Burmah, Malay peninsula, and the islands of Sumatra, Java, and Borneo. In India it is not found in Lower Bengal.

(200) REEVES' MUNTJAC.

(CERVULUS REEVESI—*Ogilby.*)

It is smaller than a *kākūr*.

Hab.—Southern China.

The characteristic features of the muntjacs are the bony pedicels covered with hair on which the small antlers are situated, and the large upper canines of the males. In *C. muntjac* a V-shaped fold of skin gives a peculiar expression to the face.

(201) THE WAPITI DEER.

(CERVUS CANADENSIS—*Schreb.*)

The wapite is the largest of the deer kind; it has a light coloured patch surrounding the tail; there are two brow antlers, the lower forming a right angle with the beam. The young of the wapite are spotted.

Hab.—North America.

LENGTH OF LIFE IN CAPTIVITY.

From January 1879 to July 1883.

(202) THE FORMOSAN DEER.

(CERVUS TAËVANUS—*Swin.*)

"The full-grown male has antlers about twice as long as its head, with a short brow antler given off at an acute angle from the beam, and there are two other tines besides the brow antler, one being a strong tine developed from the anterior surface half-way up the beam, and the other from the posterior surface in its upper third."—*Anderson.*

Hab.—The island of Formosa.

LENGTH OF LIFE IN CAPTIVITY.

About four years; the death being caused by an accident.

(203) THE BARASINGHA DEER.

(CERVUS DUVAUCELLI—Cuv.)

It is called barasingha from the fact that each antler generally bears six times; the beam of the antler is somewhat flattened.

Hab.—The Terai region of the Himalayas, extending as far east as Assam, and along the Brahmaputra to the Sunderbuns; also found in Orissa and Central India. Specimens have been received from Malda, Rungpore, Gowhati, and Orissa.

LENGTH OF LIFE IN CAPTIVITY.

Over twelve years.

(204) THE SAMBUR DEER.

(CERVUS ARISTOTELIS—Cuv.)

Known as *sāmbār* or *sāmar* generally throughout India; *Javao* in the Himlayas.

Horns vary much in thickness, length, and direction and extent of the curvature; those from Central India have generally been found to possess massive antlers with greater outward curvature than those from Northern Bengal or the Terai: the colour of the skin also varies from sandy brown to dark brown; in adolescent females a ferruginous tint is visible.

Hab.—It is found throughout India, from a height of nearly 10,000 feet in the Himalayas to the extreme south of the peninsula, extending westward as far as the banks of the Sutlej, and eastwards through Assam and Burmah to the island of Hainan.

LENGTH OF LIFE IN CAPTIVITY.

From 1875 to 1885: death being due to an outbreak of rinderpest.

(205) THE EQUINE DEER.

(CERVUS EQUINUS—Cuv.)

Is closely allied to the sambur, but slender in form and smaller in size.

Hab.—Borneo, Sumatra, and the extremity of the Malayan peninsula.

LENGTH OF LIFE IN CAPTIVITY.

From February 1880 to August 1885. In this case also the death resulted from an attack of rinderpest.

(206) THE HOG DEER.

(CERVUS PORCINUS—*Zimm.*)Hindi—*Para*, generally throughout India.*Hab.*—Found throughout the whole length of Terai extending across the Gangetic valley to Assam and Burmah.

(207) THE RUSA DEER.

CERVUS HIPPELAPHUS—*Cuv.*)*Hab.*—Java.

(208) THE MOLUCCA DEER.

(CERVUS MOLUCCENSIS—*Müll.*)*Hab.*—Amboyna and the Celebes islands. In these deer the posterior branch of the beam of the antler is larger than the anterior, and they have short muzzles.

LENGTH OF LIFE IN CAPTIVITY.

A molucca deer lived for about seven years, and a rusa deer has been living since July 1888.

(209) THE AXIS DEER.

(CERVUS AXIS—*Erxl.*)Hindi—*Chital*, generally throughout India.*Hab.*—The Sub-Himalayan and the Terai regions; Central and Southern India, extending to Ceylon; extremely common and numerous in the Sunderbuns of Bengal; specimens are said to have been obtained from north of the Brahmaputra in Assam; it does not extend beyond the Punjab. According to Captain Forsyth, very common in the valley of the higher Narbada.

Hybrids between the hog and spotted deer are often produced and exhibited.

(210) THE REINDEER.

(RANGIFER TARANDUS—*Linn.*)

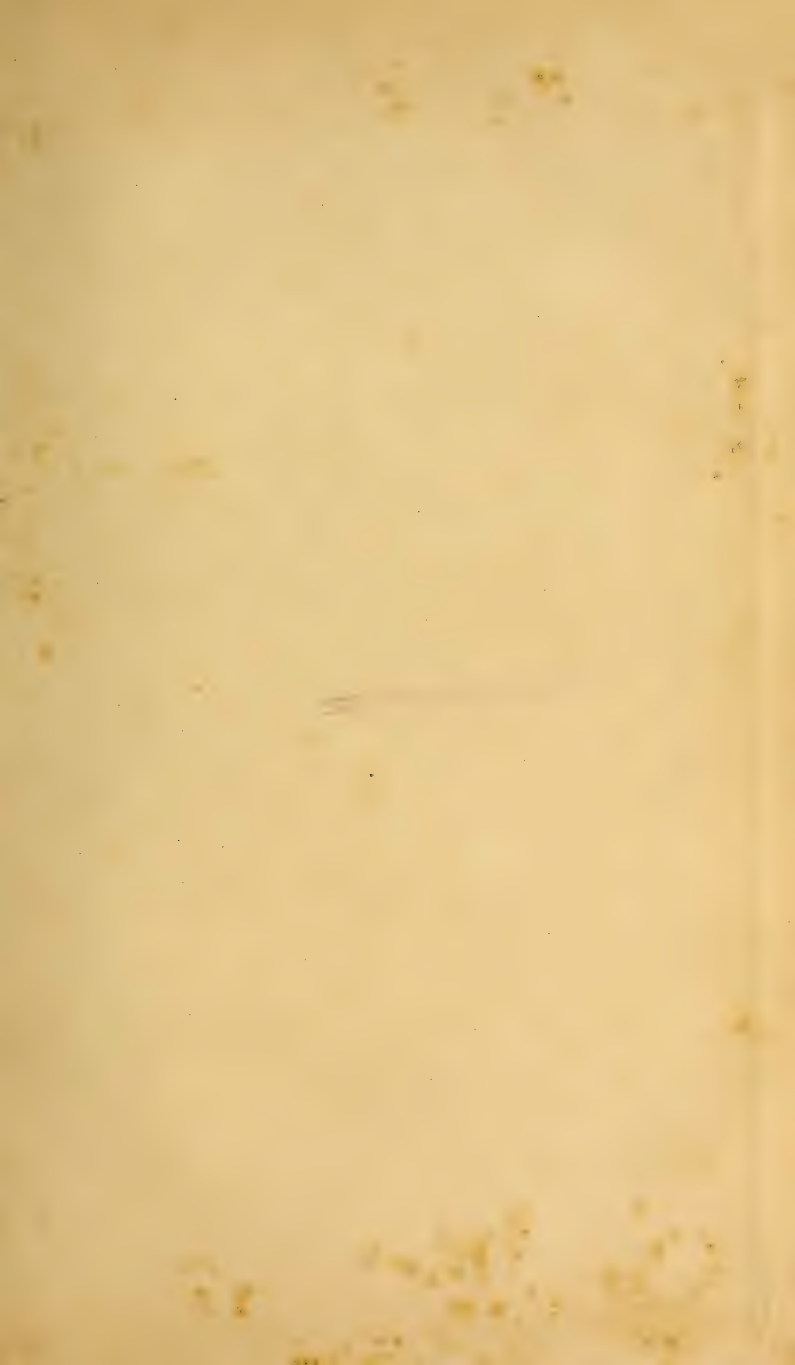
The characteristic feature of this species is the presence of antlers in both sexes.

Hab.—Northern parts of Europe, Asia, and America.

TREATMENT IN HEALTH.

Housing.—The following general remarks with regard to the formation of paddocks for deer and other ruminants may be useful:—

It is both economical and convenient to build the paddocks in a series; the site selected should be away from a public road and the front entrance to a garden; before the grounds are enclosed, the condition of



ZOOLOGICAL GARDEN - CALCUTTA.



Photocolor.

Survey of India Office, Calcutta, December 1890.

Devi-Shah.

the drainage should be properly ascertained, and if defective, improved. The back of the paddocks should be formed of a brick wall at least 6 feet 6 inches high, or, in other words, a compound wall should be built along this side, and utilized for this purpose.

It is cheaper in the long run to use iron for the fencing, which should be of an uniform pattern, though its strength may vary according to the strength of the animals to be placed inside. A 6 feet high fencing is enough to prevent most of the ruminants from jumping out, although in some instances swamp deer and nilgai have been known to clear walls and fences of nearly that height; but uryals, ibex, and other animals of that group require special arrangement, if it is essential to keep them within bounds; either the fencing should be higher, or they should have a covered enclosure. Quick-growing trees should be planted within the paddocks to afford the animals shade, which is welcome to all and indispensable to some, such as the gyal, gaur, wapite, sambur, &c.; tanks, proportionate to the size of the enclosures, should also be provided for the latter animals, especially the wapite and sambur, which frequently resort to water; a few trees on the banks overshadowing the water will keep it cool during the fierce midday heat of the summer. Shallow excavations, about 18 inches deep, may be made under the shade of trees and filled with water, to allow the animals to roll themselves in mud and ooze, which, while lowering the temperature of their body, helps to protect them from flies and mosquitoes also. They are quick to take advantage of such muddy depressions, which some of them themselves make with their sharp pointed horns. A gravel path about 3 feet broad should be laid inside each enclosure, along its front and sides.

A shelter of some kind is necessary to protect the animals from the vicissitudes of climate, although under ordinary circumstances spotted and hog deer do without any, beyond that afforded by trees and shrubs; but even amongst these, circumstances constantly happen rendering it necessary to confine one or other of them in houses. Each shed should consist of a stall, enclosed with fencing of the same pattern as that used for paddocks, and a retiring room with plank or brick wall; it should be built, if possible, against the compound wall, or at least far back in the paddock. Details of arrangements, however, must always vary, and be modified according to requirements.

Food.—The following are the principal grains used for feeding the ruminants:—gram, Indian-corn, paddy, and bran. A quarter to half a seer each for the smaller, and half to one seer for the larger deer and antelopes, of a mixture consisting of gram and bran, or gram and paddy or Indian-corn, with salt and onions, will generally be found enough, if ample opportunity for foraging for themselves exists. During the winter and summer, when the lawns become parched up, or when the number of animals in an enclosure is larger in proportion to the extent of the turf, quantities of grass, hay, and other fodder should be supplied, in addition to the small allowance of grain, salt and onion. Of the various species of trees and shrubs in a garden, many yield palatable and wholesome fodder to the ruminants, and of such not a twig or branch that is pruned, or a leaf or pod, green or dry, that falls during the autumn and spring, should be thrown away, but carefully saved, collected, and offered to the animals. As far as consistent with

the horticultural aspect of an ornamental garden, trees and shrubs of such economic value should be largely planted. Ruminants, and for that matter other animals also, should not be fed on newly harvested gram and Indian-corn, which are indigestible and induce alimentary disorders; to be fit for consumption, the grain must be at least three months old, and even then it is better to mix them with older stuff.

Breeding.—Antelopes, gazelles, and deer have freely bred in this garden. To protect the young from the nocturnal attacks of jackals and pariah dogs, both the doe and the fawn require to be enclosed in a place of safety, until such time as the latter is old and strong enough to withstand its enemies. Mothers sometimes refuse to nourish the young, rendering artificial feeding necessary. There are several ways of accomplishing this; the hand may be dipped in a basin of milk and the animal coaxed to lick the fingers; a regular feeding bottle may be used for the purpose, or a primitive one made with a small piece of tubular bamboo, with its open end cut obliquely, so as to facilitate insertion into the mouth. The milk should always be mixed with a small quantity of tepid water before feeding. Some animals require seclusion to induce them to suckle their young, but there are again positively bad and negligent mothers which take no notice of their offspring.

The young of wapite and hog deer are born spotted; the spots on the former soon disappear, but in the latter they remain more or less distinct until after the animal attains maturity.

Transport.—Deer with soft velvety horns should not, if possible, be selected for transport, unless perfectly tame and quiet, and the cage well padded; those with mature horns should have their antlers sawn off to within an inch of the burr. For large and valuable animals like the wapite the box should be padded inside; exposure to midday heat of the sun should, as much as possible, be avoided in all cases. The difficulty, however, is to secure a deer for transport, especially when a great many of them remain loose in a large parklike paddock, enjoying almost as much freedom as in their wild state, without the attendant risk. The safest method, though dilatory, is to decoy them into the retiring room of the shed; but the animals are extremely suspicious and wary, detecting danger with marvellous quickness, and constantly the artifice fails. To coerce them is dangerous, causing loss of limb or life of one or the other of them. Strong netting made of loosely twisted hempen rope may be successfully employed in catching the hinds, which generally give most trouble. If time permits, a space about 10 feet by 5 feet, or larger if required, may be enclosed round the usual feeding place of the animals; the work should progress piecemeal, so as not to arouse the suspicion of the animals: much of the success will, of course, depend upon the way the trap-door works. Wood is no doubt the best material to build such a trap with, but if iron fencing be used, bundles of paddy, straw, or hay may be strung together to form a rough screen, and hung round as padding.

TREATMENT IN SICKNESS.

Deer are subject to all the ailments already mentioned as being common to other ruminants.

OBSERVATIONS ON THEIR HABITS.

The muntjacs are retiring, unsocial, and suspicious; they are ungainly and awkward in movement, owing to their hind quarters being higher than the head and neck, which they carry low; they have a shrill bark, which is, however, not often heard in captivity. Instances are known of male muntjacs inflicting severe wounds by their sharp canines, and in one case it was a deep and dangerous one indeed.

The wapiti loves shade and water, to which they frequently resort both during the day and night in summer: they regularly shed their coats at the approach of the warm weather, and about the middle of February thick patches of woolly hair come off different parts of the body. The coats of the formosan deer undergo changes of colour; during the summer it resembles the spotted deer, but in winter it is uniformly brown like a molucca deer. The Barasingha is, however, more remarkable for its seasonal transformation, as it is accompanied by a corresponding change in the temperament of the animal. It sheds its horns about February and March, sometimes later, and in about three weeks its coat is changed from an uniform sandy brown to fawn colour of a delicate and agreeable shade, with a series of white spots longitudinally arranged on either side of the median line of the back; it loses its fierce and dangerous character, and becomes as mild and timid as a lamb. The colour and temperament, however, gradually change as the horns harden and the rutting season approaches; by about the end of June, if the rain has already commenced, or the beginning of July, the animal becomes again fierce and dangerous; it charges at the fencing if any one approaches it, stamps the ground with fore feet, grinds its teeth in rage, digs the ground with its horns with all the symptoms of immoderate sexual excitement. When in a quieter mood, it enjoys a mud bath in the slushy hollow of its own digging. Its call note, which has been described as "being a combination of the bray of an ass and the squeaking, grinding sound of a native oil press," is only heard about this period. Like the wapiti, the sambur is very fond of shade and water, some being more aquatic than others. A young equine deer has frequently been observed to stand for hours together in breast-deep water, feasting upon the duck weeds: though not generally aquatic, spotted deer have sometimes been noticed to resort to water for the same purpose. The female deer sometimes fight among themselves, and use their fore limbs as effectively as the males do their horns; they rear themselves on their hind legs, and hug and batter one another with the fore limbs. A pugnacious female would, when sulking, attack a stag also, rearing up and striking and biting in this case its hind quarters. A female wapiti once attacked a gentleman who was superintending its transfer from one division of a paddock to another; the animal in a fit of temper suddenly reared and struck him down with its fore limbs.

(211) THE INDIAN CHEVROTAIN.

(*TRAGULUS MEMMINA*—(Erl.))

Hab.—Central and Southern India and Ceylon. Specimens have been obtained from Orissa and Chota Nagpore.

(212) THE MALAYAN CHEVROTAIN.

(TRAGULUS NAPU—*F. Cuv.*)*Hab.*—Malayan peninsula.

(213) THE JAVAN CHEVROTIAN.

(TRAGULUS JAVANICUS—*Pall.*)*Hab.*—Java.

(214) STANLEYAN CHEVROTAIN.

(TRAGULUS STANLEYANUS—*Gray.*)*Hab.*—Malayan peninsula.

In general aspect the chevrotains resemble the agouties.

LENGTH OF LIFE IN CAPTIVITY.

Chevrotains or mouse-deer are delicate animals, and do not thrive in the climate of Bengal. The Indian species have, however, done better than the Malayan ones.

TREATMENT IN HEALTH.

Housing.—Damp should be avoided, and care should be taken not to let the animals out to graze until the grass is dry.

Food.—Gram, bran, Indian-corn, grass and leaves.

Breeding.—The Indian chevrotains have often bred in this garden, the female generally producing two at a birth.

TREATMENT IN SICKNESS.

Paralysis of the hind quarters and *diarrhoea* are common among these animals.

OBSERVATIONS ON THEIR HABITS.

The chevrotains are timid and shy; but though mild and gentle as a rule, they are sometimes much given to fighting among themselves, especially the males.

(215) THE GUANACO.

(AUCHENIA HUANACUS—*Molina.*)

General aspect of the animal resembles a camel, but it has no hump, and the toes are separate, with distinct pads and long curved nails; colour uniform light brown, passing into white below.

Hab.—Found over the highlands of the Andean region of Equador and Peru, extending to the plains of Patagonia and the forest-clad islands of Terra del Fuego.

LENGTH OF LIFE IN CAPTIVITY.

From July 1878 to August 1883; it had lived for about seven years in another menagerie.

TREATMENT IN HEALTH.

Housing.—A paddock such as that described for the ruminants constitutes suitable accommodation for these animals; a damp situation should be scrupulously avoided.

Food.—They appear to thrive well on crushed food consisting of gram, Indian-corn and bran; also hay, grass, and leaves.

TREATMENT IN SICKNESS.

Two of the guanacos died from the effect of an obstinate kind of *skin disease* which baffled treatment.

The disease was probably the effect of the bad sanitation of the place to which the animals had to be transferred.

OBSERVATIONS ON THEIR HABITS.

Though wary in their wild state, they become very tame in captivity, so that they have often been noticed to come prancing and cantering near the fencing and look inquisitively at visitors; they are, however, nasty animals to approach, owing to their disagreeable habit of spitting with or without provocation. They have a ringing metallic cry, which is only uttered when the animal is excited. For further information about their habits see Darwin's "Journal of a Voyage round the World."

(216) THE CAMEL.

(CAMELUS DROMEDARIUS—*Linn.*)

The Arabian camel is now unknown in a wild state.

(217) THE BACTRIAN CAMEL.

(CAMELUS BACTRIANUS—*Linn.*)

It is distinguished from the preceding species by having two humps; it is also more heavy and thick-set in form, and has longer and thicker hair, especially on the head, neck, and armpits.

Hab.—Found in a domestic or semi-domesticated state throughout greater portion of Turkestan, extending as far as the shores of the Black Sea on the west and the Chinese frontier on the east.

LENGTH OF LIFE IN CAPTIVITY.

The climate of Bengal is most unsuitable to camels, which generally have not done well. One of the Bactrian camels lived for about four years, but it was an old animal, having already lived for several years in the menagerie of the late King of Oudh.

TREATMENT IN HEALTH.

Housing.—The camels are desert animals, and should have an absolutely dry place to live in; the kind of accommodation recommended for a giraffe, but less elaborate and costly, will do extremely well for these animals. They should be led about for an hour or two every day or trained to carry children: exercise keeps them in health. The floor of their shed should be thickly sanded.

Food.—Camels appear to thrive best on hay and leaves, which may now and then be supplemented by crushed food. They are fond of various species of nim (*melia*) and babul (*minusa*) leaves, which may be given dry or green.

TREATMENT IN SICKNESS.

In Lower Bengal camels become generally subject to various kinds of *skin diseases* and *superficial ulcers*; to prevent or keep them in check, perfect cleanliness of the body is indispensable. During the wet season, when it is not judicious to bathe them often, they should be thoroughly rubbed and groomed every day. The occasional application of sulphur dust, even if there be no abrasion or ulceration, is beneficial; it prevents insects lodging in the hair and irritating the skin, causing them to rub violently against anything. One of the Bactrian camels suffered from and died of abscess of the liver, another became subject to *paralysis of the hind limbs*, and while partially recovering from it *hernia* and *prolapsus ani* supervened. Both of them were at first reduced, but the former became at last unyielding, and the health of the animal having by this time become much impaired, to put an end to its misery it was killed.

OBSERVATIONS ON THEIR HABITS.

Camels are uninteresting animals, being slow, lazy, and stupid.

(218) THE HIPPOPOTAMUS.

(HIPPOPOTAMUS AMPHIBIUS—*Linn.*)

An adult hippopotamus measures about 12 feet along the back. The young animal exhibited in this garden was about three years old, and did not exceed 3 feet and a few inches in length.

Hab.—Widely distributed in the rivers and lakes of Africa. The animal exhibited here was said to have been captured at Zimbaringo, near Dara-e-Salam.

LENGTH OF LIFE IN CAPTIVITY.

From March 1886 to September 1887.

TREATMENT IN HEALTH.

Housing.—An enclosure, with a tank similar to that recommended for the rhinoceros, is suitable for a hippopotamus also. The experience

acquired, however, is imperfect, as the young animal exhibited here did not live long.

Food.—Almost from the time of its capture, the young animal here spoken of was fed on boiled barley and preserved Swiss milk twice daily, the same diet being continued for a considerable time after its arrival. It took a long time to be completely weaned from this food and feed upon grass and leaves only.

Transport.—Of such an aquatic animal requires special arrangement to suit its requirements, but the owner of this young animal had unfortunately neglected this precaution, and kept it in an ordinary box cage, not only during the passage of the steamer from Zanzibar to Calcutta, but for a considerable time previously.

TREATMENT IN SICKNESS.

The animal above mentioned died from *distention of the stomach* caused by overfeeding. There was *obstruction of the intestines* also. It was ascertained after death that most of the teeth, molars and premolars especially, were malformed and deficient in enamel.

OBSERVATIONS ON ITS HABITS.

It remained most part of the day under water, came out at the time of feeding, but generally not until it was called several times. Its feeding done, it again retired into water. At night it came out again, walked about nibbling grass and leaves, or slept inside its house, always taking to the water before it was quite dawn. It was observed to remain under water for more than ten minutes at a time.

(219) THE WILD PIG.

(*SUS CRISTATUS*—*Wagner.*)

Hab.—India.

(220) THE ANDAMAN PIG.

(*SUS ANDAMANENSIS*—*Blyth.*)

Hab.—Andaman Islands.

The experiment of keeping wild pigs in a dry enclosure with a retiring shed has succeeded better than keeping them in damp slushy ground. They must, however, have a mud bath during the hot weather.

(221) THE PIGMY HOG.

(*SUS SALVANIA*—*Garson.*)

This diminutive pig does not exceed 26 inches in length from snout to vent; tail rudimentary.

Hab.—Nepal and Bhutan Torai.

LENGTH OF LIFE IN CAPTIVITY.

From March 1886 to June 1889.

TREATMENT IN HEALTH.

Housing.—The same style of house as has been recommended for many other animals of similar habits will suit them also, viz., a sleeping chamber and an outer enclosure. The latter should be lined with planks for about 3 feet from the ground to prevent their injuring themselves, as they are apt to dash against fencing at the slightest alarm.

Food.—The garden was unfortunate with several of these animals, chiefly, as it now appears, owing to improper feeding. Whenever any of them was acquired, it was sent down with instructions to feed it on soaked paddy and roots. Whatever their liking for this diet might have been in their own climate, it did not suit them here. They have been found to thrive better on kitchen refuse, consisting of boiled meat, eggs, vegetables, boiled rice, &c.

Transport.—They should never be conveyed in cages made with battens, rods, or wire.

OBSERVATIONS ON THEIR HABITS.

Pigmy hogs are extremely timid and shy, as already indicated, remain constantly in concealment during the day, coming out only at night, but if there is the least movement anywhere, they immediately seek shelter again; they have invariably been observed to prefer dry ground to mud and slush.

(222) THE BABIRUSA.

(BABIRUSA ALFURUS—*Less.*)

Description.—The body of the babirusa is barrel-shaped and the skin almost entirely devoid of hair. Its most characteristic feature is the growth of the canines in the males; those of the upper jaw pierce through the upper lips, shoot upwards like horns, and are then arched backwards over the eyes; the lower tusks are also directed upwards and backwards.

Hab.—Islands of Celebes and Baru.

LENGTH OF LIFE IN CAPTIVITY.

From April 1880 to May 1884.

TREATMENT IN HEALTH.

Housing.—May be housed like the pigmy hogs; a small masonry tank filled with mud and water will suffice. But for this and the next animal enclosures like those recommended for the rhinoceros and tapir are no doubt far more suitable.

Food.—Fruits, roots, vegetables and grain; it has never been observed to show partiality for a meat diet.

TREATMENT IN SICKNESS.

Both the animals exhibited here died somewhat suddenly, the female undoubtedly from fat.

OBSERVATIONS ON THEIR HABITS.

Though denizens of a tropical climate, they appeared to suffer from heat during the fierce hot days of May and June, probably more from radiated heat than from the effect of temperature; at such a time, they much enjoyed a cold bath; though generally retiring, these animals were less shy than even a wild Indian pig.

(223) THE WHITE-LIPPED PECCARY.

(DICOTYLES LABIATUS—Cuv.)

Description.—The body is densely covered with thick bristly hair; a large gland is situated on the back towards the tail, which is very small; colour grizzled blackish; lips white.

Hab.—South America.

LENGTH OF LIFE IN CAPTIVITY.

From December 1882 to May 1891.

It was killed by a spotted deer, with which it long lived in amity and peace.

TREATMENT IN HEALTH.

With regard to *housing* and *feeding*, it may be treated like the preceding species.

OBSERVATIONS ON ITS HABITS.

The character of this individual animal was formed of two opposite and contradictory elements, amiability and pugnacity. Generally it behaved as if it were a most sociable and agreeable creature, both in relation to visitors and animals with which it kept company. It nimbly trotted up to the side of the fencing, and enjoyed being gently stroked with a stick, especially if it touched the gland, with evident satisfaction; but when in a sulky and disagreeable mood it snapped and hissed at everything with its bristly hair standing on end. It once inflicted a severe injury to a Malayan tapir with which it had long been friendly. Its next companion was a rhinoceros, but it soon took a dislike to its company, effected an escape by jumping over a three feet high wall, and made itself at home with a pair of spotted deer; here it lived unmolested, but often annoying its companions, for nearly two years, until one morning it unusually provoked the male by biting its nose, and was immediately speared.

(224) THE TWO-TOED SLOTH.

(CHOLÆPUS DIDACTYLUS—(Linn.))

Description.—It has a short, round head, with very small external ears; fore limbs longer than the hind; tail rudimentary; body clothed with long, coarse hair.

In this species the fore limbs are furnished with two toes; in the hind limbs three middle toes are developed.

Hab.—Forests of Brazil.

LENGTH OF LIFE IN CAPTIVITY.

From November 1885 to November 1889.

TREATMENT IN HEALTH.

Housing.—It should have a lofty and spacious cage, with a number of dry branches stuck inside, so that it can pass from one to the other without descending to the ground. To economise space, the cage may be divided into two stories, the lower one adapted to a terrestrial animal; or other devices may be adopted. On the whole, its arboreal habits and aversion to descend to the ground should, as much as possible, be recognized.

Food.—Feeds on leaves and fruits; the feeding and drinking vessels should not be placed on the ground.

TREATMENT IN SICKNESS.

The specimens shown here died from *inflammation of the bladder*.

OBSERVATIONS ON ITS HABITS.

Always clings with hook-like claws to the branches or bars of cages, with the back downward.

(225) THE GREAT ANT-EATER.

(MYRMECOPHAGA JUBATA—Linn.)

Description.—Head elongate, produced into a long snout covered with skin; opening of the mouth very small; it has an enormous bushy tail; the prevailing colour of the body grey, with a broad black band.

Hab.—South and Central America.

LENGTH OF LIFE IN CAPTIVITY.

About eighteen months.

TREATMENT IN HEALTH.

Housing.—It should be remembered that the animal walks on its knuckles, so that a hard stone floor will hurt it, and as it is not addicted to burrowing, a cage with a mud floor should be preferred, or a thick

layer of sandy earth spread over the brick flooring. It should always have a thick bedding of straw, especially during the winter.

Food.—Finely minced raw meat and egg with milk constitute a capital diet for this animal.

TREATMENT IN SICKNESS.

After having lived for about a year in this garden, the animal became subject to *diarrhoea*, which, although for the time yielded to aromatic powder of chalk administered with milk, was never altogether cured; after death somewhat deep *ulceration* was found in each hind foot.

OBSERVATIONS ON ITS HABITS.

It rested or lay asleep during the greater part of the day, enveloping its body with its bushy tail while at repose, and generally became active towards evening.

(226) THE SIX-BANDED ARMADILLO.

(*DASYPUS SEXCINCTUS*—*Linn.*)

Description.—The chief characteristic of this species is the presence of a hard bony covering which protects the upper surface of the body, overhanging each side, and forming chambers into which the limbs are withdrawn; the top of the head is also protected by a shield, and the tail has a covering of bony plates; the exposed surface of the limbs is covered by bony scales; the inner surface of the limbs and the under surface of the body have no covering and are clothed with hair.

Hab.—South America.

LENGTH OF LIFE IN CAPTIVITY.

A specimen has been living since 1879.

TREATMENT IN HEALTH.

Housing.—This specimen has thrived remarkably in a cage 10 feet by 5 feet with thickly sanded brick floor, and placed under a small shed well sheltered by a clump of bamboos. The place is dry, shady and retired. There is a box for the animal's shelter during the day.

Food.—Finely minced meat raw or boiled; generally the former.

OBSERVATIONS ON ITS HABITS.

It sleeps the whole day, generally inside the box, but sometimes outside. It has been repeatedly observed to sleep on its back, and so soundly as not to move until touched.

(227) THE HIMALAYAN ANT-EATER.

(*MANIS AURITA*—*Hodgs.*)

Hab.—Inhabits the slopes of the Himalayas, ascending to five or six thousand feet, and extending to China and Burmah.

(228) THE INDIAN ANT-EATER.

(MANIS PENTADACTYLA—*Linn.*)*Hab.*—The drier parts of India.

(229) THE MALAYAN ANT-EATER.

(MANIS JAVANICA—*Blyth.*)*Hab.*—Burmah, Malacca, Java, and Borneo.

The garden has not yet succeeded in keeping these animals alive for any length of time, owing chiefly to the difficulty of procuring regularly and in sufficient quantity their natural diet, the *termites*. On one or two occasions they have even been known to take no notice of this food when placed within their reach. Various other things have from time to time been tried, but without avail. They are now, if received, generally let loose to forage for themselves. A manis has been found to swim across a tank 110 feet wide, and burrow under the foundation of a wall 6 feet deep.

(230) THE VIRGINIAN OPOSSUM.

(DIDELPHYS VIRGINIANA—*Shaw.*)

It has a long prehensile tail, and long bristle-like hair, mingled with fur.

Hab.—Temperate North America, as well as central and tropical South America.

A specimen lived for about a year only.

(231) GEOFFROY'S DASYURE.

(DASYURUS GEOFFROYI—*Gould.*)

A small civetlike animal, with a yellowish brown coat, profusely spotted with white.

Hab.—Found almost all over Australia.

. LENGTH OF LIFE IN CAPTIVITY.

These animals have on the whole done well here, a pair having lived over six years.

TREATMENT IN HEALTH.

Housing.—May be treated like shrews and small cats.

Food.—Finely minced meat and egg. They are particularly fond of small mammals, such as rats and mice.

OBSERVATIONS ON THEIR HABITS.

Very retiring in disposition and thoroughly nocturnal, hiding the whole day under straw or inside a box.

(232) THE TASMANIAN DEVIL.

(SARCOPHILUS URSINUS—*F. Cuv*)

Form bearlike; has a large head; muzzle short and broad; ears rounded; the prevailing colour of the body black.

Hab.—Tasmania.

LENGTH OF LIFE IN CAPTIVITY.

One lived for about three months, and another for about a year. The former never recovered from the effect of the long sea voyage; the latter died from *disease of the liver*, which was very much enlarged—almost six times its normal size. Although provided with good accommodation, it never took the least exercise, and although occasionally tempted with live fowls and rabbits, it never attempted to kill any. It touched not a morsel of food for about a fortnight before its death.

(233) THE COMMON WOMBAT.

(PHASCOLOMYS WOMBAT—*Per. et Less.*)

Fur coarse; ears short and rounded; muffle naked.

Hab.—Tasmania.

(234) THE HAIRY-NOSED WOMBAT.

(PHASCOLOMYS LATIFRONS—*Owen.*)

Fur smooth and silky; ears large and pointed; muffle hairy.

Hab.—South Australia.

In general appearance the wombats look like small bears, with very short legs, or like exaggerated marmots.

LENGTH OF LIFE IN CAPTIVITY.

Specimens have been living since 1889.

TREATMENT IN HEALTH.

Housing.—Avoid damp and wet; a brick floor to their shed is necessary, as otherwise they will burrow out immediately, but it may be thickly covered with sandy earth. It is better for their health if they can be let out every day to forage for themselves within a grassy enclosure, as it compels them to take more exercise than they otherwise would. The experiment, however, failed, owing to their persistent habit of burrowing out under the fencing. They were once tried in an enclosure with a brick wall, of which the deep foundation, it was thought, would prevent their burrowing out, but as one of them somehow managed to drown itself in the small tank inside it, the survivors were removed.

Food.—Grass and leaves; a small quantity of grain every morning, and sometimes biscuits.

OBSERVATIONS ON THEIR HABITS.

Shy and retiring in disposition, they seldom come out of their inner chamber during the day. As a rule they are gentle and inoffensive, but occasionally they have been found to fight among themselves, and bite each other. Their habit of burrowing has already been mentioned.

(235) THE VULPINE PHALANGER.

(PHALANGISTA VULPINA—(Shaw.))

About the size of a small fox; general colour of the body grey; ears white; tail black.

Hab.—Australia.

LENGTH OF LIFE IN CAPTIVITY.

Specimens have lived over three years.

TREATMENT IN HEALTH.

With respect to *housing* and *feeding*, it may be treated like a flying squirrel (see page 117), except that it feeds on soft vegetables and roots.

OBSERVATIONS ON ITS HABITS.

It is nocturnal in habits, so that it is always hiding under the straw. It is an active creature at night, when it may be seen jumping with great nimbleness and agility.

(236) GAIMARD'S RAT KANGAROO.

(BETTONGIA GAIMARDI—Gray.)

Smaller in size than a rabbit; head short and broad; tail prehensile, with a tuft of hair at the end.

Hab.—Australia and Tasmania.

LENGTH OF LIFE IN CAPTIVITY.

From June 1882 to January 1892.

With respect to *housing* and *feeding*, it may be treated like the preceding species; entirely a terrestrial animal.

(237) THE YELLOW-FOOTED ROCK KANGAROO.

(PETROGALE XANTHOPUS—Gray.)

The tail of this species is thinner than in the next one, and is pencilled.

Hab.—The whole of the mainland of Australia.

(238) THE GREAT KANGAROO.

(MACROPUS GIGANTEUS—*Linn.*)*Hab.*—Eastern Australia and Tasmania.

(239) THE RED KANGAROO.

(MACROPUS RUFUS—(*Desm.*))*Hab.*—Australia.

Kangaroos are very characteristic animals, distinguished from all others by the peculiarities of their general conformation, especially of the limbs.

(240) BENNETT'S WALLABY.

(MACROPUS BENNETTI—*Waterhouse.*)*Hab.*—Australia.

(241) THE BLACK WALLABY.

(MACROPUS UALABATUS—(*Less.*))*Hab.*—Australia.

LENGTH OF LIFE IN CAPTIVITY.

The kangaroos and wallabies have not done as well as might have been expected. Some of them have, however, lived since 1882.

TREATMENT IN HEALTH.

Housing.—A sleeping chamber with a dry raised floor, opening into a spacious foraging ground, forms capital accommodation for kangaroos and wallabies. There is no objection to their keeping company with each other in the large open-air enclosure, but their retiring chambers should be distinct for each species. Here in Lower Bengal, the ground being generally damp, it is on the whole better to provide a low wooden platform, wherever possible, and induce the animal to sleep upon it.

Food.—Kangaroos and wallabies are strictly vegetable feeders; besides grass and leaves which they pick up for themselves, a small quantity of Indian-corn, wheat, and other grain is generally allowed them.

Breeding.—The wallabies have on several occasions bred in this garden.

TREATMENT IN SICKNESS.

Paralysis of the lower limbs is a common disease among the kangaroos and wallabies in this garden, brought on, no doubt, by dampness of the floor of their sleeping chamber and want of exercise. In

mild cases the animals recover at the approach of warm weather; in others the *paralysis* increases, some other disease, such as *inflammation of the lungs* or *diarrhœa* supervenes, and the animals die. *Ulceration of the mucous membrane* of the gums and the tongue has been known to cause the death of a wallaby.

An apparently healthy wallaby died after having been dull for three or four days, during which time it scarcely ate or drank. On an autopsy being performed a large *cancerous tumour* was found in the pyloric end of the stomach. In the stomach of another wallaby was found a large ball of wallaby's hair, deeply imbedded in the substance of the mucous membrane.

Scrofula occasioned the death of two wallabies, one of them born and bred in captivity. In both of them the glands of the neck were suppurated.

OBSERVATIONS ON THE HABITS OF KANGAROOS AND WALLABIES.

Generally they are timid and harmless creatures, though capable of inflicting serious wounds in self-defence. They sometimes fight among themselves by hugging each other, trying to strangle the adversary between the fore limbs; and at the same time biting and fleecing it. The ball of hair that was found in the stomach of a wallaby was probably the result of one or more fights like this. They are very inquisitive, though timid, especially the wallaby. Some of them are often observed to follow a visitor from one end of the enclosure to the other, or to remain in one spot for minutes together watching every movement.

PART II.

(1) THE INDIAN HOUSE CROW.

(CORVUS SPLENDENS—*Vieill.*)Hindi—*Kawa*. Bengali—*Kák* or *Pát-Kák*.

The colour of the Indian house-crow varies a great deal; the purple-blue reflexions of the black portions of the plumage are sometimes wanting, and the ashy-grey colour of the neck is much lighter in some specimens than in others. The colour of the legs and bill also varies: albinoid forms of crows are not uncommon.

Hab.—The Indian house-crow is found all over India, ascending the Himalayas to about 4,000 feet; it also occurs in Burmah and Siam.

LENGTH OF LIFE IN CAPTIVITY.

An albino specimen has been living in the garden since 1883.

TREATMENT IN HEALTH.

Housing.—It is a hardy animal and thrives well in an ordinary aviary; a bath is indispensable, especially during the hot weather. A house-crow is not a desirable bird to keep in an aviary, as it cannot but be a source of annoyance to others.

Food.—In captivity it feeds on boiled rice, crumbs of bread, minced meat and all scraps and remnants of food, being omnivorous in its appetite.

Breeding.—Indian house-crows have never bred in actual captivity in the menagerie, but they breed freely in a semi-domesticated state within the garden. They begin to build in February and March, and generally select a high branch of a tree; dry grass, straw, jute or other soft materials being used in lining the nests, which are built of sticks; in one instance a nest was discovered to be lined with feathers, which the crows must have pecked off the back of an emu. The breeding season lasts from March to June or July: crows have been noticed to carry sticks for building, even so early as the middle of February.

Transport.—No special arrangement is necessary for the conveyance of a hardy and common bird like this: it is much better to place at least half a dozen of them in one cage or box, as singly, or in pairs, they may pine; guard also against fright and excitement.

Nothing is known about their ailments.

OBSERVATIONS ON THE HABITS OF A COMMON CROW.

Although familiar and obtrusive when living in a semi-domesticated state, it behaves exactly like any other thoroughly wild bird as soon as restraint is put upon its liberty, and even after having been in

captivity for some time it shows none of its wonted familiarity, cunning and intelligence. The case is different with birds taken young, which have been known to become wonderfully tame. An excellent account of a crow's habits has been given by Jerdon in his "Birds of India," volume II.

(2) THE MAGPIE.

(PICA RUSTICA—(*Scop.*))

Both the European and the Asiatic forms have been represented in the garden. Not only is the amount of white variable in different specimens, but their size appears to vary also.

Hab.—Europe, Northern Asia, and North America. In India its range is confined to the Western Himalayas.

LENGTH OF LIFE IN CAPTIVITY.

The longest period during which one has lived in the garden has been about six years.

TREATMENT IN HEALTH.

Housing.—As magpies generally inhabit temperate regions, their accommodation should be cool and shady. A couple of them may do well in an ordinary parrot cage (about three feet square), but in such close confinement it has been noticed that their fine tails become injured: a lofty and somewhat spacious compartment of a large aviary is undoubtedly preferable, as in such a place they can live in company with many other birds of the same family and genus. A hollow log of wood or a box may be given them for retirement. During the hot season a tolerably large basin of water should be supplied, besides the drinking water, as they are fond of bathing in sultry weather.

Food.—These birds appear to thrive well on a mixed diet consisting of minced meat, fruit, especially plantains, boiled rice, boiled eggs and satoo.

Breeding.—Magpies have never bred or even laid in this garden, but they have several times been observed as making attempts to build.

Transport.—The flat-bottomed wicker baskets in which they are imported from China and the Straits are by far the best for conveying them from place to place; a proper arrangement should, of course, be made for providing good drinking water, as without it these birds suffer greatly. As they will eat almost everything consumed by man, no difficulty need be experienced in feeding them in transit.

TREATMENT IN SICKNESS.

Magpies, like many other birds, suffer from bad moult, and seldom recover until after the next moulting season. Perfect cleanliness and a good dietary are the only remedies that can be suggested for them while in this state.

OBSERVATIONS ON THE HABITS OF MAGPIES.

The queer antics and familiar inquisitiveness of magpies afford great amusement. Although they have frequently been heard to imitate the whistling and cackling sounds of birds living in adjacent cages, none of those exhibited have ever been known to imitate the human voice. Their thieving propensities are well known; bits of meat, biscuits or any other articles of food are sometimes stowed away in a corner or buried under the sand. Anything bright and shining attracts their attention. A tame magpie likes to be caressed and spoken to, and is somewhat demonstrative; in short, it makes a very good pet.

(3) THE BLACK-RUMPED MAGPIE.

(PICA BOTTANENSIS—*Deless.*)

This magpie is much larger than the preceding species. Its distinguishing characteristic is that its rump is entirely black.

Hab.—Bhutan, Sikkim and Chinese Tibet.

A single specimen was once obtained from Bhutan, but it only lived a week or ten days.

(4) THE RED-BILLED BLUE MAGPIE.

(UROCISSA OCCIPITALIS—(*Blyth.*))

Description.—Head, neck and breast black, an irregular-shaped white patch on the nape continued down to the back of the neck; some of the feathers of the neck white (though not invariably so); wings brown or bluish brown; the quills white-tipped; the tail blue, the two central feathers with broad white tips, the others with black and white tips; beneath, from the breast, white, tinged with purple. Iris brown; in very old specimens red; bill and legs red; in very young birds the bill is orange red.

Hab.—It is found in the Himalayas from the extreme north-west to Nepal; said to be common in the Naga hills, about Bhamo, and in Arracan; generally distributed throughout Burmah. Specimens are now and then brought to Calcutta by China steamers. The Angami Nagas who came to Calcutta during the Exhibition of 1883-84 used the tail feathers of this bird for the purpose of decoration.

(5) THE YELLOW-BILLED BLUE MAGPIE.

(UROCISSA FLAVIROSTRIS—(*Blyth.*))

It resembles the red-billed blue magpie in form and colour, but is somewhat smaller. Its distinctive features, as its name implies, are its yellow bill and its generally duller hue.

Hab.—It also inhabits the Himalayas, from Ladak and Hazara to Bhutan, frequenting higher elevations than its near ally—the red-billed blue magpie.

LENGTH OF LIFE IN CAPTIVITY.

The longest period during which these magpies have lived in the garden has been nearly three years. In spite of the high elevations at which they are accustomed to live, these birds appear to bear captivity well.

TREATMENT IN HEALTH.

Housing.—These birds never thrive in small cages such as are used for keeping parrots, &c. The only successful method of keeping such birds is to assign to them a lofty and spacious aviary, where they may have the opportunity of flying about from perch to perch. If practicable, it is better to lay down doob grass on a portion of the floor of the aviary, as they have a habit of searching on the ground and enjoy pecking at the grass and earth. Magpies, as most birds, like sunning themselves, but care must be taken that they are not too long exposed to the sun at its height. A bath should be provided, and during the hot weather they derive benefit from the application of a garden syringe.

Food.—Like the crow and common magpie, they thrive on food of all kinds.

Breeding.—Neither of these two species last mentioned has ever bred in this garden, but as the experiment of keeping them in pairs by themselves in some quieter place has not been tried, it cannot be said with certainty whether they are capable of breeding in the climate of Lower Bengal.

TREATMENT IN SICKNESS.

A bird apparently healthy has sometimes been known to drop down dead suddenly. This may be either caused by the rupture of some blood vessel or by *apoplexy*. If life is not altogether extinct, an attempt may be made, in cases of apoplexy, to bring the patient round by administering a dose of castor-oil and applying tepid water to its feet, but treatment of any kind is rarely successful.

Diarrhœa.—If caused by indigestion only, or change of temperature, no attempt should be made to stop the discharge in the first instance; the bird should be watched, and if there is much straining and discolouration of the down it should be taken out in a small cage, and the down gently washed with tepid water; this will serve to relieve the straining also. If the flow continues for more than twenty-four hours, about 15 drops of castor-oil and 2 of tincture of opium should be given.

They no doubt suffer from other ailments in captivity, but as nothing definite is known about them, it is better not to hazard conjectures.

OBSERVATIONS ON THEIR HABITS.

Both the red and the yellow-billed blue magpie are less sociable birds than the magpie (*Pica rustica*); they are never observed to greet a visitor's approach with the same familiarity and pleasure as the latter evinces; they are, however, never timid. When living in company with many other species of smaller birds, they are sometimes found

to tyrannize over them. The red-billed species is less noisy than the yellow-billed, which has a shrill ringing note, and utters it while on the wing.

(6) THE GREEN MAGPIE.

(CISSA CHINENSIS—(Bodd.))

Bengali—*Sirgunj* or *Sirgun*.

Description.—The general colour of the body green or bluish green; head and neck yellowish green; the feathers of the head are somewhat lengthened backwards, a black streak commencing at the lores runs through the eyes and meets with the opposite one at the nape, the central feathers of the tail tipped white, the outer tipped with black and white; the wing-coverts red. Bill coral-red, iris red, legs coral-red; the shades of green vary in different specimens, and in confinement they generally become paler; in some a faint shade of brown is visible on the abdomen.

Hab.—It is found in the South-Eastern Himalayas, and extends through the hill ranges of Assam, Sylhet, Arracan and the Burmese Provinces, to Tenasserim; specimens have been obtained from Sikhim, Bhutan, Comilla, Tipperah, Chittagong and Arracan.

LENGTH OF LIFE IN CAPTIVITY.

The longest period during which one has lived in the garden has been about six years.

TREATMENT IN HEALTH.

Housing.—Pugnacious and predatory habits render it rather a difficult bird to provide with accommodation. Fresh arrivals may be kept in small cages until they become familiar with the food and the locality, otherwise they must be treated in the same way as the *Urocissa* (Nos. 4-5). Small and delicate birds should not be kept in the same cage with this one.

Food.—Meat forms a considerable portion of its food in captivity. The most successful method of feeding it is to mix a quantity of minced meat with satoo, and make the compost into small pellets; it should also be allowed grasshoppers and other insects regularly; to sharpen its appetite and to give tone to its system sparrows and similar small birds should also be given occasionally.

Breeding.—These birds have never bred in this garden, nor have they ever attempted to build.

TREATMENT IN SICKNESS.

Nothing definite is known about their ailments in captivity; they have been known to die as suddenly as the *Urocissa*, but as no autopsy has ever been held in such cases, the cause of death has not been ascertained.

OBSERVATIONS ON THE HABITS OF A GREEN MAGPIE.

They are bold and inquisitive birds, and become so tame as to come to the side of the cage or aviary to peck off food held to them. They sometimes treat the smaller birds in the same aviary with unsparing cruelty, and fight much among themselves.

(7) THE INDIAN TREE-PIE.

(DENDROCITTA RUFA—(*Scop.*))

Bengali—*Handi-chānchā, Tākā-chor.*

The Indian tree-pie is extremely common, being found all over the country from Kashmir to Travancore and from Assam to Tenasserim, including Mergui, inhabiting the plains at the level of the sea and ascending the Himalayas up to about 7,000 feet; it is also common in Burmah.

LENGTH OF LIFE IN CAPTIVITY.

It does not appear to bear captivity well, as no specimen has ever lived for more than about eighteen months; it is not, however, a delicate bird. No serious attempt has ever been made to keep it alive for a lengthened period owing to the facility of replacing any casualties.

TREATMENT IN HEALTH.

Housing.—It never thrives in a cage, and may therefore be treated like the Urocissa (Nos. 4-5). As it is tyrannical in disposition, no small birds should be placed with it.

Food.—Minced meat, satoo, fruits and various kinds of insects.

Breeding.—Many of these birds live wild within the garden, where they breed during the summer, generally building their nests of twigs and grass on mango and peepul trees. Nothing is known about their ailments in captivity.

OBSERVATIONS ON THE HABITS OF THE INDIAN TREE-PIE.

It is shy, restless and somewhat quarrelsome, seldom coming to the side of the aviary to receive food or to be stroked. The harsh metallic chuckling note so characteristic of this bird in a wild state is not often heard in captivity. Its mental capacity does not appear to be susceptible of education to any appreciable degree. Though common, it is worth exhibiting, as by its particoloured plumage and restless habit of darting across the aviary and flying from perch to perch, it adds much to the effect and liveliness of the show.

(8) THE HIMALAYAN TREE-PIE.

(DENDROCITA HIMALAYENSIS—(*Blyth.*))

Description.—Slightly smaller than the Indian tree-pie, its total length including the tail being about 16 inches. Forehead, lores, and feathers above the eye black; throat and sides of the head dark sooty brown; crown of the head, nape and upper part of the neck ashy black, with bluish

reflexions ; lower back and scapulars dirty brown, rump and upper-tail coverts ashy wings and the wing-coverts black ; with the exception of the first two, all the primaries have a patch of white at their base ; two central tail-feathers ashy with broad black tips, the outer tail-feathers black ; lower parts from the throat brown, becoming paler towards the abdomen. Bill black or horny black, irides red-brown.

Hab.—Found throughout the Himalayas, from the valley of the Sutlej to Sadiya, ranging through the hill tracts of Assam to Tenasserim. It is not known to occur in the plains, but is found in the hills only, at an elevation from 2,000 to 7,000 feet.

LENGTH OF LIFE IN CAPTIVITY.

One has been living in the garden during the last six years.

(9) THE BLACK-BROWED TREE-PIE.

(*DENDROCITTA FRONTALIS*—*McClell*)

About the same size as the Himalayan tree-pie, the total length including tail about 15 inches. The distinctive feature of this species as compared with the preceding one is that there is more black in its colouring ; the forehead, the greater part of the top of the head and its sides, chin, throat, forepart of the neck, tail, wing quills and the primary coverts being all black ; nape, back of the neck, upper part of the back, breast and upper abdomen ashy grey ; lower back, scapulars, upper tail-coverts, rump, lower abdomen, chestnut or chestnut brown : bill horny black.

Hab.—Found in the Himalayas from Nepal to the extreme east of Assam.

LENGTH OF LIFE IN CAPTIVITY.

A specimen has been living in the garden for upwards of four years.

With regard to TREATMENT IN HEALTH and SICKNESS, both the Himalayan and the black-browed tree-pie may be treated like the Indian tree-pie. Details of treatment should, however, always be varied according to individual temperament and surrounding circumstances. On one or two occasions this bird has been tried with others in a large aviary, but this has not answered, as they are extremely quarrelsome and cruel, readily pouncing upon other birds. It appears better, upon the whole, to give them a cage to themselves and keep them in a place comparatively less frequented. A cold bath is indispensable for them during the hot weather.

OBSERVATIONS ON THE HABITS OF THE HIMALAYAN AND THE BLACK-BROWED TREE-PIE.

Both these species appear to be extremely shy, and untameable ; those that have lived in the garden for three or four years are still almost as wild as they were on their first arrival, and on their cages being approached they become very restless, as if frightened and surprised. Their chuckling note is very discordant.

(10) THE BLACK-THROATED JAY.

(GARRULUS LANCEOLATUS—*Fig.*)

Description.—The total length of this bird, including the tail, is about 12 inches. The colouring of the head, face, and ears black, the hind neck and the back vinous grey; in very healthy and adult specimens the rump and upper tail-coverts brighter; chin, throat, and the upper part of the breast black with white streaks, the black ending in iron grey on the upper breast; the feathers of the upper breast are lanceolate; the plumage lower down vinous grey; tail blue with black bars and white tip; the primaries and secondaries black with blue bars on the outer web; both the primaries and secondaries are white-tipped; the tertiaries grey with a broad black band and a white tip. During the period of moult, the colouring of the head, face and neck becomes almost pale ashy, much of the blue of the tail and wings disappears; the white shaft streaks of the foreneck are somewhat variable in different specimens; iris reddish or orange red; legs and feet brownish grey or pinkish slaty; bill yellowish at the tip, the colour varies at the base.

Hab.—The Himalayas as far east as Nepal. Common about Almora and Dehra during the winter.

LENGTH OF LIFE IN CAPTIVITY.

Specimens exhibited have lived for about four years.

TREATMENT IN HEALTH.

Housing.—It never does well as a cage bird, but thrives in a large and spacious aviary in company with other birds.

Food.—Satoo, minced meat, insects and fruits.

They have never bred in this garden.

Transport.—Winter is the best time for moving and acclimatizing them in the plains.

TREATMENT IN SICKNESS.

Half of the new arrivals appear to die from various causes, all arising, no doubt, from injudicious treatment during the transit; nothing however, is definitely known about their ailments.

OBSERVATIONS ON THE HABITS OF A BLACK-THROATED JAY.

The black-throated jay is sociable and lives in perfect amity with other birds, whether large or small. It is seen to great advantage when wheeling round some object or flying about an aviary; it seldom alights on the ground; it has a musical note and utters it while on the wing or about to change its perch. It has never been known to become very docile. Like many other birds, it does great mischief to ornamental plants hung up in baskets; it readily make friends with other species, so that it and a necklaced thrush, or any other bird, may not be unfrequently seen engaged in fondling one another.

(11) THE BLUE-BEARDED JAY.

(CYANOCORAX CYANOPOGON—*Max.*)

Description.—General colour pale brown; tail with broad white bands at the tip; head, sides of the face, neck and throat black; a large blue spot over the eyes; nape and hind neck white; under surface of the body whitish.

Hab.—Brazil.

Four specimens received in November 1888 never recovered from the miserable condition in which they reached the garden, and died within a month or two of their arrival.

(12) THE RED-BILLED CHOUGH.

(GRACULUS EREMITA—(*Linn.*))

Resembles a house-crow in form, but is more slender; its whole plumage is glossy black, bill slender, curved, and coloured brilliantly red; legs and feet red.

Hab.—Found in the Himalayas from Kashmir to Bhutan; in Kashmir it is common at low elevations during the winter, but in summer frequents very high altitudes; in Sikkim it has been observed at elevations from 9,000 to 16,000 feet. Its western limit reaches as far as Europe and Abyssinia, extending eastwards as far as China.

(13) THE YELLOW-BILLED OR ALPINE CHOUGH.

(PYRRHOCORAX ALPINUS—*Vieill.*)

Its plumage is also black, but wanting the same gloss as in the Red-billed Chough; bill yellow, feet red.

Hab.—It also inhabits the Himalayas from Kashmir to Bhutan, generally at very high elevations.

LENGTH OF LIFE IN CAPTIVITY.

Both the specimens died within a month and a half after their arrival at the garden.

TREATMENT IN HEALTH.

These birds will never thrive in the plains, and it would therefore be better if they were never brought down from the hills, and much less to Bengal. The specimens which came under observation fell accidentally into the possession of the garden, and all that could possibly be done to mitigate their sufferings and prolong their life was tried, but without avail.

(14) THE BLACK-THROATED LAUGHING THRUSH.

(DRYONASTES CHINENSIS—(Scop.))

Description.—The general colour of the bird is brownish black above; forehead, lores, parts round the eyes, chin, throat, and the middle of the upper breast black; cheeks and ear coverts white; nape and top of the head slaty blue; tail olive-brown, with a broad terminal black band; primaries grey; breast and upper portion of the abdomen ashy grey; remaining part of it brown or ashy brown; bill black; iris red; the length of the bird is about 11 inches.

Hab.—China and Burmah.

LENGTH OF LIFE IN CAPTIVITY.

The longest period during which a specimen has lived in the garden has been over five years.

TREATMENT IN HEALTH.

Housing.—A small cage suits as well as a large aviary, but for the purpose of a Zoological garden, the latter is to be preferred. Unless the bird is perfectly healthy and its wings and feathers are clean and free, it should not be placed with other birds at once on its arrival, as in that case it is likely to be tormented by the older inmates of the houses; this precaution should be observed in all such cases.

Food.—It maintains excellent health when fed upon a mixed diet consisting of satoo, minced meat, insects and worms.

Breeding.—These birds have on some occasions been observed in the act of carrying hay, leaves, &c.; the object, no doubt, was domestic, but they have never been known to lay eggs.

TREATMENT IN SICKNESS.

New arrivals generally suffer from slight *diarrhœa*, brought on by change and abundance of diet. No attempt should in such cases be made to treat the symptoms, but the cause should be removed.

OBSERVATIONS ON THE HABITS OF A BLACK-THROATED LAUGHING THRUSH.

Sociable in disposition, it soon becomes very tame, familiar, and demonstrative, responding to caresses and attentions by assuming singular attitudes and sitting at the side of the cage or aviary picking up food from the hand. It never sits still, but is always active, either flying about from perch to perch, or engaged in play with some companions of the same or other species. It whistles beautifully, and has also a sort of subdued note. Often it may be seen away in a corner of the aviary, assiduously searching for insects and larvæ, both of which form no inconsiderable portion of its diet.

(15) THE HIMALAYAN WHITE-CRESTED LAUGHING THRUSH.

(GARRULAX LEUCOLOPHUS—(*Hardw.*))Hindi—*Rawet Kahi*.

Description.—Head with crest, cheeks; sides of the neck, chin, throat and breast white; the occiput or hindermost feathers of the crest grey or ashy; the space in front of the eye, ear coverts and parts in front, behind and below the eye, black, appearing like a broad black streak from the nostrils through the eye to the ear-coverts; the rest of plumage olive-brown, the lower plumage tinged with a rufous shade. Bill horny black, iris red-brown; its total length is about 11 inches.

Hab.—Himalayas, ranging from Gurhwal to east of Assam, and extending through the hill ranges to Arracan and Pegu; a specimen has been obtained at Bassein. They are generally brought down from Kumaon, Almora, Darjeeling and Bhutan for sale in Calcutta.

LENGTH OF LIFE IN CAPTIVITY.

The longest period during which one of these birds has as yet lived in the garden has been nearly seven years.

TREATMENT IN HEALTH.

Housing.—Although a spacious aviary is the best for this species, it may, if necessary, be also treated as a cage-bird. Preference should, however, be always given to the former mode of housing, as in that case the bird has an opportunity of seeking its own food on the ground, and a number can live together. It has been sometimes found necessary to separate, as a punitive measure, an aggressive and quarrelsome specimen from the company of the others, and keep it by itself for a longer or shorter period according to circumstances. These birds are fond of rolling on the sand, which should therefore be provided, besides the usual bathing arrangement.

Food.—Satoo, fruits, insects and worms. It may be frequently seen searching for food in the sand and turf on the floor of an aviary, and if it lights on a centipede, a yulus or a cricket, attacks it with great energy and force, and kills and devours it forthwith; sometimes it treats satoo and other food like insects, that is, beats it repeatedly and energetically before eating.

Breeding.—These birds have never laid or even attempted to build in this garden.

Transport.—No special recommendation is necessary for the transport of these birds, which may be effected in a common cage.

TREATMENT IN SICKNESS.

Diarrhœa.—Occasionally occurs among these birds; the same treatment as has been recommended under *Urocissa* (Nos. 4-5) will generally prove effective if arising from the same cause, such as indigestion or

unsuitable food. In common with many other species these birds appear to suffer from a kind of *chronic cold*. The real nature of the disease has never been ascertained, but the patient suffers a good deal, with an almost constant running from the nostrils; these sometimes become stopped up, the bird's appearance is dishevelled, and food is often left untouched. In a majority of cases the tongue will be found to be inflamed and its tip hardened. The usual plan of treatment adopted by the Indian bird-fanciers in such cases is to remove the scale off the hardened tip of the tongue and then to smear it with some *ghi* (clarified butter) and pepper, or sugar; for the next day or two the bird is fed by hand upon nutritious articles; the result is, of course, not always satisfactory.

The above symptoms may be connected with some organic disease.

OBSERVATIONS ON THE HABITS OF A WHITE-CRESTED LAUGHING THRUSH.

In captivity even, when a number of them live together in a large aviary, they assemble from time to time and chatter and scream loudly and discordantly for a minute or two and then disperse. They are extremely active and restless, feed constantly on the ground, picking up earth and grass in search of insects. Either from sport or in a spirit of destructiveness, they sometimes destroy the nests built by other birds living in the same aviary. The great peculiarity of the chattering habits of these birds is that, when one commences, others approach and join in the chorus.

(16) THE BLACK-GORGETTED LAUGHING THRUSH.

(*GARRULAX PECTORALIS*—(*Gould.*))

Description.—Colour of the plumage olive-brown with a rusty tinge on the nape and hind neck; its distinguishing characteristic is the broad black band on the upper breast; chin and throat white or whitish; cheeks, lores, and ear-coverts white or grey, streaked with black, or sometimes pure black; enclosing this space are two narrow black lines which, commencing at the base of the bill, encircle the eyes and ears, and then unite into a somewhat broad band, which passes down the sides of the neck and then joins the pectoral band; the middle-tail feathers olive-brown, the next two are of the same colour, but with black tips, the terminal tail feathers with a double band of black and white; a narrow white streak above the eyes; lower surface fulvous; abdomen whitish. Bill black horn colour; iris orange-brown. The total length of the bird is about 12 to 13 inches.

This species varies somewhat in the colour of its plumage according to the locality it inhabits.

Hab.—Found in the Himalayas from Nepal to Assam, extending to Burmah also.

LENGTH OF LIFE IN CAPTIVITY.

Specimens have lived from three to four years.

(17) THE WHITE-THROATED LAUGHING THRUSH.

(GARRULAX ALBIGULARIS—(Gould.))

Description.—General colour of the plumage olive-brown, washed with fulvous on the forehead, crown and ear-coverts; the space in front of the eyes and feathers over and beneath black; cheeks, chin and throat white, from which fact it derives its specific name. Wings brown, edges being rich olive-brown; tail olive-brown, the four outer feathers having broad white tips, sides of the neck olive-brown continuing down to the upper chest and meeting with that of the opposite side to form a broad olive-brown pectoral band; the colour of the lower plumage varies from rusty brown to bright ferrugineous; iris bluish grey; bill leaden-black. The total length of the bird is about 12 inches. In captivity the colour of the plumage of some specimens becomes very pale.

Hab.—Found in the Himalayas from near Simla to Bhutan and Sikkim up to about 9,000 feet; by some authorities it is said to be found in Assam also; it extends into Western China.

LENGTH OF LIFE IN CAPTIVITY.

A specimen lived from May 1883 to the latter end of 1887.

(18) THE WHITE-SPOTTED LAUGHING THRUSH.

(IANTHOCINCLA OCELLATA—(Vig.))

Description.—Forehead, crown, nape and neck in front blackish-brown; space in front of the eye, front of the face, and supercilium bright fulvous; upper back and sides of neck fulvous, having subterminal broad black marks to all feathers which are tipped light fulvous; scapulars, wing-coverts, lower back, rump and upper tail-coverts reddish-brown, studded with white spots having black marks in the centre; quills white-tipped; middle tail-feathers chestnut with white tips, outer tail feathers rufous with black and white tips; each side of the throat rufous with black bars; breast fulvous or buff with broad black bars; the lower breast and abdomen plain fulvous without any bar. Bill yellowish; legs dull yellow; iris yellow brown. Total length about 13 inches.

Hab.—Found in Nepal and Sikkim at elevations from 8,000 to 10,000 feet. Lo-Karreum-pho, which is the Lepcha name for this bird, is said to be common in some places near Darjeeling.

LENGTH OF LIFE IN CAPTIVITY.

Specimens obtained in 1887 are still alive and well.

TREATMENT IN HEALTH.

With regard to *housing, feeding and transport*, the birds numbered 16 to 18 may be treated like the white-crested laughing thrush

(No. 15). The white-spotted laughing thrush does fairly well as a cage-bird, if only one or a pair be kept in a small cage, but they do better in a large aviary. It is of great importance that something like occupation should be given to these, and for that matter to all other birds in captivity, as otherwise they suffer as it were from ennui, which brings on other diseases. Baskets with plants hung from the roof, shingles, small pieces of stones and green turf laid on the floor, also mirrors and bells, are some of the objects which may be used with advantage in an aviary, as they not only serve the purpose of decoration, but occupy the time of the inmates.

Food.—The same remarks, as have been made with regard to the food of the white-crested laughing thrush, apply to these birds also. Although none of these have ever been observed to kill large centipedes and insects with the same ferocity as the former, yet they are as persistent in their search for these articles of food as that bird. No opportunity of supplying them with earth-worms, insects and similar articles of diet should be lost.

Transport.—The best time for bringing them to the plains is the winter, as otherwise the sudden change from the cool, bracing climate of the hills to the sultry heat of Bengal greatly affects them. If it is intended to send them across the sea, they should be sufficiently tamed and accustomed to the change of food.

TREATMENT IN SICKNESS.

A white-necked laughing thrush once suffered from an *overgrown beak*, and it was curious that, after the superfluous growth had been filed off, it grew again, and ultimately caused the death of the bird.

OBSERVATIONS ON THEIR HABITS.

They are identical in habits with the white-crested laughing thrush; the gorgetted and the white-necked thrushes are more arboreal than the others, whereas the white-spotted laughing-thrush is fond of sitting hidden amidst the foliage, and is decidedly less noisy than the others. The white-throated laughing thrush is sociable and somewhat inquisitive; its habit of making friends with other birds is very interesting.

(19) THE STRIATED LAUGHING THRUSH.

(GRAMMATOPTILA STRIATA—(Fig.))

Description.—Light brown in colour, forehead tinged with umber-brown, beneath paler-brown; all the feathers of the body, both above and below, are longitudinally striated with yellowish white streaks, those on the abdomen being longer and wider than those on the back. Bill black, sometimes horny black, legs dusky plumbeous, iris reddish brown.

Hab.—Is found in the Himalayas from the valley of the Sutlej to Bhutan, at elevations from 6,000 to 9,000 feet.

LENGTH OF LIFE IN CAPTIVITY.

The longest period during which one has lived in the garden has been a little over three years.

TREATMENT IN HEALTH.

With respect to *housing, feeding, &c.*, it may be treated like the other laughing thrushes. It has never been tried as a cage-bird, and would probably not do well in a small cage.

In appetite it is less carnivorous than the other thrushes.

OBSERVATIONS ON THE HABITS OF THE STRIATED LAUGHING THRUSH.

It is very sociable and extremely restless. Its peculiar call referred to by Jerdon as "not unlike the clucking of a hen which has just laid an egg" may also be frequently heard in captivity while it is engaged in searching for food on the ground, or picking up earth or grass. When tame, it inquisitively follows a visitor from one side of the cage to the other.

(20) THE JUNGLE BABBLER.

(CRATEROPUS CANORUS—(Linn.))

Bengali—*Chhataria, Sâtthaia*, or seven brothers.

Extremely common in every part of Bengal. The colouring of the plumage is subject to great variation, according to season and locality. The younger birds and those that have recently moulted are much lighter in colour than those of which the feathers have become old.

Hab.—It is found all over India, ascending the hills to about 5,000 feet; always found within the garden in a wild state.

LENGTH OF LIFE IN CAPTIVITY.

As they are extremely common about Calcutta and almost as intrusive as house-crows, specimens are now and then caught and placed in a large aviary, so that it is impossible to give an idea as to the period one has lived in captivity.

OBSERVATIONS ON THE HABITS OF THE JUNGLE BABBLER.

They are as much arboreal as they are terrestrial; their habit of making a cup-shaped hole on the ground for the purpose of a dust-bath (which they take with their wings spread out) is well known; they are extremely noisy birds; very sociable amongst themselves, although occasionally given to much fighting.

(21) THE BLACK-HEADED SIBIA.

(LIOPTILA CAPISTRATA—(Vig.))

Description.—All about the head black; back and scapulars brown, washed with grey; all round the neck, the whole lower plumage,

rump, and upper tail-coverts bright rufous; the median tail feathers bright rufous with a black band and a bluish tip; in the external tail feathers the rufous portion is diminished, the black taking its place; greater wing-coverts white at the base forming a broad band; bill black; iris reddish brown; the total length of the bird is about 8 inches. In some specimens there is scarcely any grey tinge on the back.

Hab.—Found throughout the Himalayas from Simla to Bhutan; common about Darjeeling, and not unfrequently observed so low down as 4,000 feet.

LENGTH OF LIFE IN CAPTIVITY.

A pair has been living in the garden for about four years.

TREATMENT IN HEALTH.

Housing.—It appears to do well in a large aviary in company with other birds.

Food.—Fruits, insects and satoo.

Breeding.—They have never bred in this garden, and nothing is known about their diseases.

OBSERVATIONS ON THEIR HABITS.

The black-headed sibia does not appear to be a sociable bird: on the contrary it is rather exclusive in its habits; it has a twittering call, which it frequently utters while seated amongst plants; it is not much seen on the ground.

(22) SWINHÖE'S WHITE-EYE.

(ZOSTEROPS SIMPLEX—*Swinh.*)

Description.—The total length of this little bird is about 4 inches, and its general colour above olive-yellow; like most of the birds of this genus it has a ring of silky-white feathers round the eye; cheeks and throat golden-yellow, a black spot in front of the eyes, extending in the form of a streak below the eyes; breast ashy pale, abdomen whitish; under tail-coverts golden-yellow; bill black; feet dark plumbeous.

Hab.—Found throughout India from the Himalayas to Ceylon, including the Laccadives; also in Burmah, South China and in the Andaman Islands. All the specimens exhibited in the garden have come either from Burmah or China, or some of the islands mentioned above.

LENGTH OF LIFE IN CAPTIVITY.

These birds have not thriven well here, none having survived more than five or six months.

(23) THE RED-BILLED LIOTHRIX.

(LIOTHRIX LUTEA—(Scop.))

Description.—The total length of the bird is about six inches; it has a slightly forked tail, and there is a slight difference in the colouring of the sexes; the prevailing colour of the bird is olive-green, with coral-red bill. In captivity some of the specimens have been observed to lose the bright yellow colour of their throat and chin, and the yellow of the crown.

Hab.—Found in the Himalayas from Simla to Bhutan, from 5,000 to 8,000 feet; common about Darjeeling, on the Khasia hills, the Kakhyan hills near Bhamo, and in Arracan and China. Numbers of these birds are often brought to Calcutta from Singapore, to which port they are no doubt sent from China.

LENGTH OF LIFE IN CAPTIVITY.

When once acclimatized they live for about four or five years, or even more.

TREATMENT IN HEALTH.

Housing.—It is far too restless and shy to be a cage-bird; on the other hand, it becomes lost in a large and spacious aviary; it is therefore best to keep the red-billed liothrix in smaller moveable aviaries, or large cages with Java sparrows and other smaller seed-eating birds. They do better when kept in companies varying from half to two dozen than if allowed to live singly or in pairs. A large cage seven or eight feet high and five feet broad and four feet deep will comfortably accommodate two dozen of them with another dozen or two of other small birds. No cage or aviary is complete without some nesting accommodation, whether the birds build or not. Small cigar boxes, with holes just large enough to admit the bird, or an elongated box divided into compartments of the size of cigar boxes, may be placed along the top of one side of the cage. There should be perches and thin branches of trees for the birds to sit upon and tufts of jute or hemp and small bells to play with; a basin of water, besides that for drinking, should be provided as a bath; the bottom of the cage should be strewn with coarse sand and, if possible, fresh doob grass should occasionally be laid in a portion of it. It should be well protected from draughts and cold during winter nights.

Food.—In captivity its food consists chiefly of various kinds of seeds, such as millet, hemp, canary, &c.; it likes to pick up seeds from among the sand and grass; it also eats berries, fruits and insects, and is fond of nibbling at salad and cabbage leaves. Fruits, berries and salad grown in small pots may occasionally be placed inside the cage.

Breeding.—Although they are frequently noticed to carry hay, jute, &c., inside their retiring places, the liothrix have never been known to lay; this may be due to the presence of other birds in the cage.

Transport.—They are not particularly delicate, so that they are brought down from the hills in all seasons.

TREATMENT IN SICKNESS.

Nothing definite is known about their ailments in captivity; the mortality is, however, comparatively great among the new arrivals.

OBSERVATIONS ON THE HABITS OF THE RED-BILLED LIOTHRIX.

Although a liothrix is a somewhat shy and restless bird, some of them after being in captivity for a short time get sufficiently tame to come to the side of the cage to receive food from the hand, but even then they retain their nervousness. They have a chirping call, which at times they utter incessantly. Like most other birds when frightened, especially at night, they sit on the sides of the cage and thus fall an easy prey to civets, mungoses, and other predatory animals.

(24) THE GOLD-FRONTED CHLOROPSIS.

(CHLOROPSIS AURIFRONS—(Temm.))

Hindi—*Harewa* or *Sabz Harewa*.

Description.—About $7\frac{1}{2}$ to 8 inches in length; bill slender and curved, the tip being bent and notched; the general colour of the plumage bright grass-green, paler beneath; forehead and the front of the crown golden or orange yellow, with a somewhat metallic lustre; lower throat and parts about the ear-coverts black; chin, upper-throat purplish blue, a faint yellow zone surrounds the fore neck; bill black; feet plumbeous. The female is generally less brilliant in colour, the yellow of the forehead is faint or altogether wanting, and the black of the neck is of smaller extent.

Hab.—The gold-fronted chloropsis is distributed over a large area, being found in the Sub-Himalayan regions, from Gurhwal to Assam; the Khasia Hills, Manipur; the hills near Bhamo; Karennee, the whole of lower Burmah, down to Amherst and the Thoungyeen Valley. It is also found in Midnapore, Manbhum, Lohardugga, Sirgooja, the Rajmahal Hills, and portions of Eastern Bengal. This and the next species are often brought to Calcutta for sale from Midnapore and the adjacent places; hundreds of these birds are annually sold at Sonopore fair, being brought down there from Goruckpore and elsewhere in the Nepal Terai.

LENGTH OF LIFE IN CAPTIVITY.

About three years.

TREATMENT IN HEALTH.

Housing.—These birds do as well in a small cage as in a large aviary; there are, however, disadvantages in keeping them in a large and crowded aviary; they get lost, and if habituated to special dieting, as they frequently are, may neglect feeding.

Food.—Satoo sweetened with sugar and made into a soft pulp; soft fruits such as plantains, custard apple, insects, and occasionally minced meat or liver of a chicken boiled and minced. A bird accustomed to this kind of feeding, if let loose in a large and crowded aviary, necessarily finds it impossible to obtain its proper food. A bread and milk diet has also been found to suit them well.

This kind of feeding with specially prepared food does not appear to be absolutely necessary for all of them.

These birds have never built or laid in this garden.

Transport.—Harewas are sometimes purchased at and brought down from Sonapore fair; the small light bamboo cages in which they are sold are good enough to accommodate one or a couple of birds each, for three or four days, but they are far too fragile to bear the rough handling to which they are necessarily subjected during the transit by cart, cooly, boat and train. The best plan, when there are a number of cages, is to pack them all in a light deal wood or even a bamboo frame; it ensures comparative safety to the birds; the cages should on all occasions during the transport be kept covered with a piece of canvas or thick cloth. These birds are much given to fighting among themselves, and it is therefore best not to place a number of them together, especially when the distance to be traversed is great. When the journey is to last some time, the cage should, of course, be stronger, made with planks on three sides and $\frac{1}{4}$ inch wire-netting in front; a cage one foot high, 9 inches broad, and 9 inches deep, will comfortably accommodate a pair; the feeding and drinking cups should be placed at the back of the cage inside; if placed in front, their contents will be liable to be soiled, as all such birds are much given to constantly alighting on the wire-netting.

TREATMENT IN SICKNESS.

New arrivals have been known to suffer from a kind of *horny filamentous growth* at the tip of the tongue, brought about probably by the change of food. The growth should be gently scaled away, and some non-irritating bland oil applied to the tongue. It may be very easily removed by gently pressing the tip of the tongue between the thumb and the index finger, which should be smeared with powdered chalk or ash to prevent slipping.

OBSERVATIONS ON THE HABITS OF THE GOLD-FRONTED CHLOROPSIS.

When caged it becomes very tame and sociable, whistles beautifully and has a pleasing note.

(25) JERDON'S CHLOROPSIS.

(CHLOROPSIS JERDONI—(*Blyth.*))

Hindi—*Harewa*.

Description.—The general colour of the plumage grass-green; chin and throat black, surrounded by a broad band of greenish-yellow, which is also the colour of the forehead. In the females the chin and throat bluish-green.

Hab.—Found in the drier parts of the peninsula of India; they are generally brought to Calcutta from Midnapore, Monghyr, the Rajmahal Hills, and sometimes from Goruckpore.

LENGTH OF LIFE IN CAPTIVITY.

None of these birds have lived more than 12 or 13 months; they appear to be more delicate than the gold-fronted species.

TREATMENT IN HEALTH.

Should be treated in every respect like the preceding species.

(26) THE SILVER-EARED MESIA, OR SILVER-EARED HILL TIT.

(MESIA ARGENTAUROS—*Hodgs.*)

Description.—The length of this bird is about 7 inches; the nostrils are covered by a membrane; the colour of the forehead bright yellow; crown, nape, lores, cheeks, black; a broad black streak runs backward from the base of the lower mandible to below the ear-coverts, which are white; upper back and sides of the neck yellow; lower back and sides ashy; upper tail-coverts crimson; chin and throat deep orange-yellow; lower plumage olive-yellow; under tail-coverts also crimson. In the females the crimson of both the upper and under tail-coverts is replaced by orange-buff; in the young birds the crown is yellowish instead of black.

Hab.—Almost the whole range of the Himalayas, at elevations varying from 3,000 to 7,000 feet; also found in the Khasia and Naga Hills, Manipur, the Kakhyan Hills and in Tenasserim.

LENGTH OF LIFE IN CAPTIVITY.

No record has been kept of the period during which any one of these birds has lived in the garden: probably it is about the same as that of the red-billed liothrix (No. 23).

With regard to *housing, feeding, &c.*, it may be treated like the red-billed liothrix.

(27) THE SPOTTED-WING, OR THE SPOTTED-WING STARE.

(PSAROGLOSSA SPILOPTERA—(*Vig.*))

Description.—About 7 inches long; a greyish-brown bird.

Hab.—Is found in the Himalayas, as far east as the Assam Valley. The specimens exhibited lived too short a time for observation.

(28) THE HIMALAYAN BLACK BULBUL.

(HYPSPIPETES PSAROIDES—(*Vig.*))

Description.—The total length of the bird is about 10 inches; the general colour of the plumage dark brown or grey; bill and legs orange

red; the head sub-crested; the feathers being irregular and ruffled; all about the head greyish-black; ear coverts, chin, throat, breast and flanks, grey or whitish-grey; abdomen whitish; under tail coverts grey, having a broad white margin.

Hab.—Found in the Himalayas up to an elevation of about 9,000 feet, its western limit is as far as Murree, and to the east it extends through the Assam Valley to Sylhet, Cachar, Manipur, and Arracan.

LENGTH OF LIFE IN CAPTIVITY.

Nearly three years.

TREATMENT IN HEALTH.

Housing.—It is often kept as a pet in a small cage, but it does equally well in a large aviary.

Food.—Satoo made into a paste with water and a modicum of ghi or prepared with boiling ghi, fruits, insects, and maggots. Like Shamas, they may be fed on minced meat also.

TREATMENT IN SICKNESS.

The mortality among them is greater during the period of moulting, and as the majority of the deaths occur from drowning, they may be explained by the fact that the birds, being very helpless on account of the loss of feathers, fall easily into the water of the tank inside an aviary and are drowned. To prevent such accidents a piece of coarse cloth or fisherman's net should be stretched over the tank in the evening and removed every morning.

OBSERVATIONS ON THE HABITS OF THE HIMALAYAN BLACK BULBUL.

It is extremely sociable in habit, and when caged is a nice pet; is mostly arboreal, being seldom seen on the ground. The period of moult lasts very long, and while moulting it loses much of the bright orange-red colour of its legs and beak. It whistles beautifully.

(29) THE BENGAL RED-VENTED BULBUL.

(MOLPASTES BENGALENSIS—(*Blyth.*))

Hindi—*Bulbul*. Bengali—*Bulbul*.

Very common in most parts of Bengal; also found in Northern Behar and Oudh; it ascends the Himalayas up to about 7,000 feet, and is distributed along their lower ranges from Kumaon to the Assam Valley.

LENGTH OF LIFE IN CAPTIVITY.

No accurate record has been kept; it is a hardy bird, and under favourable circumstances bears captivity well.

TREATMENT IN HEALTH.

Housing.—May be kept in a small cage as well as in a large aviary. A favourite mode of keeping this bird with the Indian bird fanciers is to carry it on the fingers or on an ornamental perch, one end of a piece of string about a yard long being lightly attached to one of the legs of the bird, the other to the finger or the perch.

Food.—Fruits, satoo, &c.

Breeding.—They breed largely within the garden in a wild state; the breeding season lasts from February to June; the nests are cup-shaped and made of fibres, dry leaves and grass; of the 25 nests found in one year, more than half were built on croton bushes; the eggs are three to four in number.

TREATMENT IN SICKNESS.

Nothing particular is known of their ailments in captivity in this garden.

OBSERVATIONS ON THE HABITS OF THE BENGAL RED-VENTED
BULBUL.

This bulbul has been known to become very tame, and, when properly trained, learns to perform some small tricks.

(30) THE WHITE-CHEEKED BULBUL.

(MOLPASTES LEUCOGENYS—(Gray.))

Description.—About eight inches in length; upper plumage olive-brown, lower plumage earthy-brown; lower tail-coverts pale yellow; ear-coverts white; lores black with a narrow white streak above them. Bill black; legs plumbeous.

Hab.—Found in the Himalayas up to about 7,000 feet.

LENGTH OF LIFE IN CAPTIVITY.

These birds have generally proved short-lived in captivity in this garden.

(31) THE WHITE-EARED BULBUL.

(MOLPASTES LEUCOTIS—(Gould.))

Description.—Excepting the ear-coverts and the hinder parts of the cheek, which are white, the whole head is black; hind neck brown; upper plumage dull-brown; the lower plumage whitish-brown; under tail-coverts rich yellow. Total length about 7 inches.

Hab.—Western and North-Western India, and not uncommon in Central India and Central Provinces.

LENGTH OF LIFE IN CAPTIVITY.

Although there is no record of the actual period during which they have lived in the garden, these birds generally thrive well in captivity in Lower Bengal.

TREATMENT IN HEALTH.

Housing.—Do well in an aviary; but it is doubtful whether they can be treated as cage-birds.

Food.—The same as for the Bengal red-vented bulbul (No. 29).

OBSERVATIONS ON THE HABITS OF THE WHITE-EARED BULBUL.

They are more shy than the Bengal bulbul: in other respects, however, they have the same habits.

(32) THE BENGAL RED-WHISKERED BULBUL.

(OTOCOMPSA EMERIA—(Linn.))

Bengali—*Jhunti Bulbul*; *Sipahi Bulbul*.

Very well known in Bengal, so that no description is necessary.

Hab.—Found all over Lower Bengal, as far west as Chota Nagpore, Orissa and the Northern Circars, and distributed over the lower ranges of the Himalayas, the hills of Assam, extending to Tenasserim and Burmah. Specimens have been received from Lucknow and adjacent places. Large numbers are sometimes brought to Calcutta from the Andamans and Nicobars, to which places they have been introduced.

LENGTH OF LIFE IN CAPTIVITY.

These birds live as happily in captivity as the Bengal red-vented bulbul.

TREATMENT IN HEALTH.

In respect to *housing* and *feeding*, these may be treated like the Bengal red-vented bulbul. They rarely breed within the garden.

OBSERVATIONS ON THE HABITS OF A RED-WHISKERED BULBUL.

It is extremely active and very bold, and if properly treated becomes as tame as the Bengal red-vented bulbul. It has a pleasant chirruping note, which it generally utters while on the move.

(33) THE BLACK-CRESTED YELLOW BULBUL.

(OTOCOMPSA FLAVIVENTRIS—(Tick.))

Hindi—*Zurd-bulbul* or *Pahariya Zurd-bulbul*.

Description.—General plumage olive-yellow; head, chin and throat black. The amount and extent of black vary somewhat in different

specimens. Length about 7 inches; bill dark or ashy-brown; claws brown.

Hab.—The lower ranges of the Himalayas, from the valley of the Sutlej to Assam; the Central Provinces and southern portion of Orissa; it is also found in Tenasserim, Cochin China and the Malay peninsula. The single specimen that has as yet been exhibited in the garden came from the Goruckpore jungles.

LENGTH OF LIFE IN CAPTIVITY.

Nine months. This does not, however, represent the maximum length of life in this garden, as the bird was sent away by exchange at the expiry of that period.

TREATMENT IN HEALTH.

Housing and feeding.—It may be treated like the other bulbuls; when kept singly or in pairs, a small cage should be preferred.

(34) THE YELLOW-VENTED BULBUL.

(PYCNONOTUS ANALIS—(*Horsf.*))

Description.—The whole upper plumage brown; the breast brown, and the abdomen whitish; vent sulphur-yellow. It is of the same size as the red-vented Bengal bulbul.

Hab.—The Malay peninsula, Sumatra, Java, Borneo, Cochin-China and Siam; also found in the southernmost district of the province of Tenasserim, and abundant on the island of Mergui.

LENGTH OF LIFE IN CAPTIVITY.

Some of the specimens obtained early in the year 1888 are still alive.

TREATMENT IN HEALTH.

Housing.—These birds appear to do well in a large aviary, where they find opportunity for searching for food on the ground.

Food.—Insects and maggots are as welcome to them as fruits and satoo; they are rather greedy and not unfrequently over-feed themselves, and as a consequence suffer from indigestion.

Treatment in sickness.—No treatment has ever been attempted in their cases, nor is it easy to do so when they are living in a very large place.

OBSERVATIONS ON THE HABITS OF THE YELLOW-VENTED BULBUL.

It is seen on the ground much more than other species of bulbuls; it also has a pleasant chirruping note, which it keeps on uttering while hopping about on the ground or sitting on a perch. Its movements are inquisitive, and it is always ready to make friends with other species.

(35) THE BLACK DRONGO OR KING-CROW.

(DICRURUS ATER—(*Hermann.*))Bengali—*Finga*.

A very common and well-known bird in Lower Bengal.

Hab.—Common in Bengal and other parts of India, extending to China, Siam and Cochin-China; also found in the Himalayas up to about 7,000 feet. They disappear from some localities during certain seasons of the year; although pretty abundant in the garden and in the neighbourhood at other times, scarcely any can be seen during the rainy season.

LENGTH OF LIFE IN CAPTIVITY.

Of late no attempt has been made to exhibit them in the garden, so that there is no record of the period during which one has lived in actual captivity here; experience has, however, shown that they do not bear captivity well.

Housing.—There are certain difficulties in keeping this bird; it requires a lofty and spacious place, but owing to its extremely pugnacious habits it cannot be lodged with other birds; in captivity it finds no opportunity of sweeping down or taking upward flights to catch flying insects, and does not easily learn to adapt its habits to altered circumstances. For an account of the habits of this bird, Jerdon's "Birds of India," volume I, may be consulted.

(36) THE HAIR-CRESTED DRONGO.

(CHIBIA HOTTENTOTTA—(*Linn.*))Hindi and Bengali—*Kesraj*.

This is also a common and well-known bird in Bengal.

Hab.—Besides Bengal it is found in the Western Coast of India; the Himalayas as far east as Assam; Burmah and extreme south of Tenasserim.

LENGTH OF LIFE IN CAPTIVITY.

No record has been kept, but it bears captivity better than the black drongo.

TREATMENT IN HEALTH.

Housing.—It may be kept as a pet in a small cage about three feet square, or exhibited in a large aviary; it is better not to keep any small birds with it, as it is apt to tyrannize over them.

Food.—Insects, minced meat, satoo, boiled rice and milk, &c.; it is also fond of honey and other sweets. It is, however, better not to allow pure honey to birds in captivity, as the constant habit of cleaning the beak renders the feathers sticky and uncomfortable.

TREATMENT IN SICKNESS.

The only ailment from which these birds have been known to suffer in captivity is a *horny tongue*, generally accompanied by a filamentous growth at the tip (see No. 24).

OBSERVATIONS ON THE HABITS.

It becomes tame and sociable in captivity.

(37) THE LARGE-TAILED DRONGO.

(DISSEMURUS PARADISEUS—(Linn.))

Bengali and Hindi—*Bhimraj*.

This interesting bird is widely known in Bengal and many other parts of India. It varies somewhat in size and the length of its lateral tail-feathers and the tuft of its forehead; those from Bengal are generally smaller with comparatively smaller head tufts than those from Goruckpore, Almora, and other places in the Himalayas and the Terai.

Hab.—Most parts of India, also Burmah, Ceylon and Tenasserim.

LENGTH OF LIFE IN CAPTIVITY.

A specimen obtained in 1886 is still alive and well.

TREATMENT IN HEALTH.

Housing.—May be treated like the preceding specimen (No. 36). If kept in a cage, the latter should be large, as otherwise the tail will be injured. In this garden the Bhimraj is kept in one of the smaller divisions of the principal aviary, which is about ten feet long, six feet broad, and some twenty-two feet high. A specimen has been known to be so amiable in disposition as to keep company with pigeons and chakar partridges; as soon, however, as an attempt is made to associate other species of drongos, or even magpies, it swoops down upon and torments them. Whether it is kept in a cage or in an aviary, a bath should be provided.

Food.—Minced meat, satoo, insects, maggots, &c. A bhimraj has been known to kill rats and lizards.

TREATMENT IN SICKNESS.

These birds suffer from *bad moult*, and in such cases the long tail feathers do not appear until after the next season. The only treatment that can be recommended is cleanliness and good food.

OBSERVATIONS ON THE HABITS OF A BHIMRAJ.

Very sociable in habits, and when properly tamed affords great amusement; intelligent and knowing, and has evidently some idea of fun; bhimrajes have been known to frighten shamas by mewing like a cat.

(38) THE GREY-BACKED SHRIKE.

(LANIUS TEPHRONOTUS—(Vig.))

A specimen lived for a few days only.

(39) THE BLACK-NAPED ORIOLE.

(ORIOLOUS INDICUS—Jerdon.)

Bright yellow, with a horse-shoe shaped black mark on the nape extending from the base of the bill. Length about $9\frac{1}{2}$ inches.

Hab.—Greater portion of the Indian peninsula.

(40) THE ANDAMAN BLACK-NAPED ORIOLE.

(ORIOLOUS ANDAMANENSIS—Tytl.)

Smaller than the preceding species and with a narrower black band on the nape.

The females have the yellow parts less bright and the back washed with green. The young males have their back also washed with olive green.

Hab.—Andaman Islands.

(41) THE INDIAN BLACK-HEADED ORIOLE.

(ORIOLOUS MELANOCEPHALUS—(Linn.))

Hindi—*Pilak*, *Zardak*. Bengali—*Bene-Bou*.

The plumage of the whole body bright yellow; head, chin, throat and upper breast black.

Hab.—Very common in Bengal and many other parts of India; also found in Burmah, Tenasserim, Ceylon and the Andaman Islands.

LENGTH OF LIFE IN CAPTIVITY.

None of these birds have as yet lived in the garden for more than four years.

TREATMENT IN HEALTH.

Housing.—All of them do well in a large aviary with other birds; new arrivals or recently-captured birds should, of course, be kept in small cages until they become used to captivity.

Food.—Satoo, insects, fruits, &c.; they especially like peepul fruits, and have also been observed to eat with avidity the fruits of *Ficus comosa* and sweet *Inga*.

Nothing particular is known about their ailments in captivity.

OBSERVATIONS ON THE HABITS OF ORIOLES.

As a rule the orioles are shy birds, and therefore difficult to tame. When three, four, or more of one species are living together,

they are seldom found to associate with each other; they are, however, not quarrelsome birds; all of them have a melodious liquid note, which they may be often heard to utter, while on the wing or seated high on a perch. Orioles are seldom seen on the ground.

(42) THE MAROON ORIOLE.

(*ORIOLUS TRAILLII*—(Vig.))

The prevailing colour of the plumage maroon-red; all about the head black.

In young specimens the head and the upper part brown; bill bluish grey; irides pale buffy-yellow; the total length of the bird is about $11\frac{1}{2}$ inches.

Hab.—Found in the Himalayas from the Valley of the Sutlej to Assam, the Khasia Hills, Manipur, Tenasserim, Pegu and Arracan.

LENGTH OF LIFE IN CAPTIVITY.

A specimen lived for about eighteen months in the garden.

TREATMENT IN HEALTH.

With regard to *housing* and *feeding* it may be treated like other orioles; the specimen that lived in the garden appeared to be more carnivorous in its appetite than other species of orioles.

Nothing particular is known about its habits.

(43) THE SOUTHERN GRACKLE, OR THE SOUTHERN HILL MYNA.

(*EULABES RELIGIOSA*—(Linn.))

Hab.—Forest-clad hills of Southern India.

(44) THE INDIAN GRACKLE, OR THE NEPAL HILL MYNA.

(*EULABES INTERMEDIA*—(A. Hay.))

The total length of this bird is from $10\frac{1}{2}$ to 11 inches, that is, about $\frac{1}{2}$ to 1 inch larger than the preceding species; the arrangement of the wattles, which are smaller, is also different from that of the other.

Hab.—Distributed along the lower ranges of the Himalayas from Kumaon to Assam, extending to Burmah and Tenasserim, also found in the Andamans and Nicobars; the specimens which are now and then brought to Calcutta from Midnapore are probably from Western Bengal and the Central Provinces.

Albinoid form of hill-myna is not uncommon. The single specimen of white myna that lived in the garden some time ago came from the Andamans.

LENGTH OF LIFE IN CAPTIVITY.

About eight years. Once acclimatized these birds bear captivity well.

TREATMENT IN HEALTH.

Housing.—The hill mynas do as well in small cages as in a large aviary, the advantages and disadvantages in both being well balanced. If kept in a cage, the latter should be at least three feet long, two feet broad and about the same in height, with the necessary perches, feeding and drinking cups and a bathing vessel. These birds are somewhat addicted to spilling their food, and for this, and other reasons their surroundings require constant cleaning: a thin bed of soft hay spread over the bottom of the cage, and renewed once every day, will serve to keep it tidy and clean. The cage should be placed in such a situation that the birds may have the benefit of the morning sun while protected from draughts and cold, to which they, especially the young birds, are very susceptible. Even where a large aviary is available for their accommodation, a cage should always be preferred for the location of young hill mynas, whose wattles and lappets are yet undeveloped, inasmuch as they are likely to require much careful nursing until after the growth of these processes.

Food.—Hill mynas are exclusively fruit-eating birds, but in captivity they also eat satoo, boiled rice and milk, bread and milk and sundry other articles of food consumed by man; some of them have been known to become accustomed to eat boiled eggs and even minced meat; where plenty of fruits, such as papaya, plantains, dates, figs, &c., are available, no other food seems to be required; yearling birds in captivity require careful feeding; satoo, bread and milk should constitute their principal diet, fruit being sparingly given.

Transport.—Hill mynas kept as pets in India are not unfrequently taken to Europe by their owners; all that is required in such cases is to get a quilted cover made for the cage and keep it inside the cabin, especially when cold latitudes are reached. When, however, a number of them are to be transported, the best plan is to put them in a snug plank cage well covered with felt and having proper arrangements to admit hot water at the bottom. These birds have never bred in this, or, so far as is known, in any other garden.

TREATMENT IN SICKNESS.

A certain affection of the eye akin to *ophthalmia* is most common among these birds in captivity; it either affects one or both the eyes, and is generally caused by exposure and cold, although unsuitable dieting may also have much to do with it. If the patient happens to be living in an aviary, it should at once be removed to a small cage, so as to admit of its being handled for treatment. The eyes should be gently washed with sulphate of zinc lotion (sulphate of zinc 1 grain, and water 1 ounce) twice daily, and the bird kept in a warm place, the cage being covered up with a piece of linen or, if the weather is cold, with a blanket; mild cases will yield to this treatment within two or three days. It generally, however, assumes a severer form before any notice is taken

and proper treatment adopted; the eyes and the surrounding parts become swollen, the eyelids tumefied and closed, and the conjunctiva completely covered with thickened and hardened discharge. As it cannot but be very painful to the patient, before any attempt at cleaning the eyes and surrounding parts is made, poppy-head fomentation should be applied with a sponge for about a quarter of an hour; the eye-lids should then be gently opened, the thickened and hardened matter adhering thereto and to the conjunctiva removed, and the solution of sulphate of zinc applied with the tip of a feather; on the second day the discharge will be less and the swelling much reduced, and in two or three days the patient will probably recover; a dose of castor-oil, twenty to thirty drops, in a little milk, should be given internally at the beginning; the diet should be light and nourishing, such as bread and milk, satoo prepared with ghi and eggs, &c.; no fruits, especially plantains and papya, are to be allowed. Mynas also suffer from other ailments incidental to a captive life. Another disease to which only the young birds become subject appears to have some close connection with the growth of their wattles and the lappets, as it commonly shows itself during the period while those processes are in the act of growing. It consists of a tumour or an abscess near to or on some part of the wattles; by way of treatment a poultice made of burnt turmeric (*Curcuma longa*) is generally applied by the bird-fanciers of Lower Bengal, and almost invariably with good results; as the young bird shows great aversion to food while suffering from this malady, it requires to be hand-fed; it is needless to say that the bird should be kept warm, and the cleanliness of the cage thoroughly attended to. It may be mentioned here that when a tumour or an abscess is well pronounced, it is by far the best to lance it.

OBSERVATIONS ON THE HABITS OF HILL MYNAS.

Besides being hardy and bearing captivity well when once acclimatized, hill mynas generally have many taking qualities, and it is no wonder that they are so largely caged, tamed and made pets of in India; they, especially the Nepal hill mynas, are, when tamed, intelligent and knowing, and learn to talk easily and with remarkable fluency and accuracy. On the occasion of a bird-show held in the garden, a hill myna owned and exhibited by a commander of one of the river steamers very much amused the visitors by its idiomatic expressions, and such words of command as "heave up," "go aft" or with ejaculations such as, "not a drop to save my soul," concluding the speech with characteristic abuse, "O, you soor." In this garden hill mynas soon learn to imitate the notes of other birds, notably those of cockatoos; they are thoroughly arboreal, seldom coming to the ground.

(45) THE GLOSSY CALORNIS.

(CALORNIS CHALYBEIUS—(Horsf.))

Description.—Externally black with a brilliant green gloss; length about eight inches; irides crimson-scarlet.

Hab.—Eastern Bengal, Khasia Hills, Tipperah, Arracan, the southern part of Tenasserim extending to the Malay peninsula, Sumatra,

Java and Borneo; all the birds received into this garden have been from the Andamans and Nicobars.

LENGTH OF LIFE IN CAPTIVITY.

These birds appear to bear captivity well, as some of them lived for about five years.

TREATMENT IN HEALTH.

Housing.—As they are gregarious and extremely arboreal, a large and spacious aviary is the best accommodation that can be assigned to them; they do better in company than singly or in pairs.

Food.—Fruits and insects, but in captivity they learn to eat satoo also.

OBSERVATIONS ON THE HABITS OF THE GLOSSY CALORNIS.

The glossy calornis appears to be an extremely noisy bird, never ceasing to chatter for a minute; it is shy and restless.

(46) THE ROSE-COLOURED STARLING.

(PASTOR ROSEUS—(*Linn.*))

Hindi—*Golabi Myna.*

The plumage of this bird differs in colour according to the season; in spring and summer all about the head, throat and upper breast black, and the upper plumage rose-colour; feathers are thrown off during the rainy season, and during the autumn and the winter the black feathers of the head, &c., are tipped with buff, and the upper plumage dirty rosy-brown.

The total length of the bird is about $8\frac{1}{2}$ to 9 inches. Those seen in captivity in Bengal have scarcely any crest, and they seldom assume their proper colour. On the contrary they have been observed to lose the rosy tint of their plumage after a year in captivity.

Hab.—With the exception of Lower and Eastern Bengal, it is found all over India, including the lower ranges of the Himalayas as far east as Sikhim; in Western Bengal it is known to occur in Manbhoom and adjacent places and rarely at Bankoora; also found in portions of Eastern Europe, Central and Western Asia. It is not, however, common in India throughout the year.

LENGTH OF LIFE IN CAPTIVITY.

They do not appear to thrive well in Lower Bengal; a few specimens have, however, been living in the garden for the last four years, but so far as the colour and crest are concerned they are poor specimens.

TREATMENT IN HEALTH.

Housing.—A large aviary is the best accommodation for these birds, and it is advisable to keep a number of them together.

Food.—Satoo, maggots, insects, fruits, and grains of various kinds ; they feed much on the ground.

OBSERVATIONS ON THE HABITS OF THE ROSE-COLOURED STARLING.

However active they may be in their wild state and in other parts of India, they appear to be rather listless and inactive in captivity in Lower Bengal ; when half a dozen or more of them are living in one place they generally keep together, whether on the ground or on the perch, and seldom engage themselves in pursuits of pleasure or exercise ; a large number of these birds have lately been acquired, they appear to spend most of their time on the ground, or on the wooden stages on which plants are arranged.

(47) THE COMMON INDIAN STARLING.

(STURNUS MENZBIERI—(Sharpe.))

Hindi—*Tilia Myna* ; *Tilora*.

Description.—Black, with fulvous-white specks ; there is a purplish red and bronze-green gloss in the plumage.

Hab.—It is a migratory bird, and a winter visitant to India, where it is common in the Himalayas and in the North-Western Provinces during that season, extending sometimes to the Deccan in the south and Monghyr in the north-east.

LENGTH OF LIFE IN CAPTIVITY.

There is no record of the period during which one has actually lived in the garden, but they are known to bear captivity well.

TREATMENT IN HEALTH.

With regard to *housing* and *feeding* it may be treated like the preceding species ; as a cage-bird it does well.

(48) THE GREY-HEADED MYNA.

(STURNIA MALABARICA—(Gmel.))

Hindi and Bengali—*Pawi*.

The *pawi* or the grey-headed myna is a well-known bird in Bengal, so that no description is necessary.

Hab.—It is found throughout India, being most common in the North-Western Provinces and some portions of Bengal.

LENGTH OF LIFE IN CAPTIVITY.

Several of them have been living for the last six or seven years in the garden.

TREATMENT IN HEALTH.

It does well in a large aviary, or in a large cage, in company with birds of other species.

Food.—Consists of grains, fruits and insects ; in captivity, like many other birds, it thrives on satoo.

OBSERVATIONS ON THE HABITS OF THE GREY-HEADED MYNA.

It is very active and restless in habits and mostly arboreal ; it has a melodious note, accompanied by much chattering ; it becomes very tame when caged.

(49) THE ANDAMAN MYNA.

(STURNIA ANDAMANENSIS—(Tytl.))

Description.—White, with upper plumage pale-greyish, and the lower plumage tinged with buff ; the wings and tail glossy black, the latter tipped with white ; legs and feet pale yellow ; bill greenish yellow ; the total length of this bird is about 9 inches.

Hab.—The Andamans and Nicobars.

LENGTH OF LIFE IN CAPTIVITY.

Specimens have been living in the garden since 1887.

TREATMENT IN HEALTH.

Housing.—It does well in a large aviary.

Food.—Fruits, insects and satoo ; among fruits they are extremely fond of the papaya (*Carica papaya*).

OBSERVATIONS ON THE HABITS OF THE ANDAMAN MYNA.

These mynas appear to retain their gregarious habit in captivity also, as whenever there are a number living in the same aviary they flock together, especially for some time after their arrival ; they have also very cleanly habits.

(50) THE BLACK-HEADED MYNA.

(TEMENUCHUS PAGODARUM—(Gmel.))

Hindi—*Pawi myna*. Bengali—*Monghyr pawi*.

Description.—Head and crest black, the lower plumage buff, and the back grey ; tail broadly tipped with white ; total length about 8 inches ; bill blue at the base, greenish in the middle, and yellow at the tip.

Hab.—The whole of India as far east as Dacca and throughout the Himalayas as high as 4,000 to 8,000 feet ; it extends to Ceylon and to Afghanistan.

LENGTH OF LIFE IN CAPTIVITY.

About four years.

TREATMENT IN HEALTH.

May be treated in the same way as the grey-headed myna (No. 48).

(51) THE BLACK-NECKED MYNA.

(GRACULIPICA NIGRICOLLIS—(Payk.))

Description.—The head white, encircled by a broad black collar; below the collar on the back is a band of black feathers margined with white; upper plumage dark brown; lower plumage white; tail dark brown tipped with white; the naked skin around the eye yellow or greenish-yellow; bill black.

Hab.—Upper Burmah; Tenasserim, Cochin-China, Siam and Southern China.

LENGTH OF LIFE IN CAPTIVITY.

A few specimens have been living in the garden since the latter end of 1886.

TREATMENT IN HEALTH.

Housing.—They seem to thrive very well in an aviary; as they are extremely sociable birds, they may also do well in small cages, although this mode of keeping them has never been tried in this garden.

Food.—In captivity it thrives well on satoo, fruits, maggots and occasionally minced meat; in fact it is very accommodating in its taste and appetite.

OBSERVATIONS ON THE HABITS OF THE BLACK-NECKED MYNA.

Black-necked myna is of a sociable disposition, and evidently takes much delight in the presence and company of men; in whichever part of the large aviary it may be, it is sure to fly to the side of the cage on the approach of a visitor, even following the person from one side to another; it has some idea of fun also, and often amuses itself at the expense of other, and even larger, birds; it is, however, not quarrelsome; on the contrary, it may often be observed attending the toilet of other species; it whistles beautifully, and has a sweet melodious song; it sings and whistles with much assiduity and force, ruffling its feathers, and raising and throwing back its head at each exertion.

(52) THE COMMON MYNA.

(ACRIDOTHERES TRISTIS—(Linn.))

Hindi—*Myna*, *Desi myna* (i.e., country myna). Bengali—*Salik*.

This extremely common bird is found all over India, ascending the Himalayas up to about 8,000 feet; not found in the northern parts of Kashmir, or in Tenasserim south of Mergui.

LENGTH OF LIFE IN CAPTIVITY.

No record has been kept, but they are very hardy and bear confinement well.

TREATMENT IN HEALTH.

With regard to *housing* and *feeding*, no particular directions are necessary. They thrive as well in an aviary as in a small cage.

Breeding.—They breed freely in the garden, both in captivity and in a wild state. In building their nests inside the aviaries they make use of the feathers cast by other birds.

TREATMENT IN SICKNESS.

Young birds have several times been noticed to suffer from *glandular swellings* round the aperture of the cloaca. The bird while suffering in this way should be kept warm and, if necessary, the part fomented.

OBSERVATIONS ON THE HABITS OF THE COMMON MYNA.

The common myna is much domesticated in India, and becomes as tame as the hill myna. It is generally sociable, although sometimes they fight a good deal among themselves. They are gregarious in habits.

(53) THE BANK MYNA.

(*ACRIDOTHERES GINGINIANUS*—(*Lath.*))

Hindi—*Ganga myna*. Bengali—*Gang salik*.

Description.—It differs from the common myna in having the general colour of the plumage grey instead of brown, and in other mirror characteristics, such as the colour of the naked skin round the eye, which is brick red.

Hab.—Besides the Gangetic provinces of Bengal, where it is very abundant, it is found throughout Upper India and Sindh, extending through the Central Provinces as far south as the Mahanadi; it is also found in the lower ranges of the Himalayas. The statement that these birds are migratory in the plains is, to a certain extent, true; they are known to desert a particular area after having lived and bred there for years. It is not unlikely that the erosion of the river banks in which they were accustomed to build their nests has much to do with such partial migrations.

LENGTH OF LIFE IN CAPTIVITY.

About seven years has been the maximum period during which some of them have lived in this garden.

(54) THE JUNGLE MYNA.

(*ÆTHIOPSAR FUSCUS*—(*Wagl.*))

Hindi—*Pahari myna*. Bengali—*Jhunt salik*.

Description.—All about the head glossy black; the upper plumage fuscus black; the throat and breast dull cinereous blackish; abdomen

reddish-cinereous; tail-coverts pure white; bill orange yellow. Those from the south of India have grey eyes, while those from the north have yellow ones.

Hab.—Except in Sindh, Rajputana and Guzerat, it is found almost all over India, ascending the Himalayas up to about 8,000 feet; it does not appear to be common about Calcutta.

LENGTH OF LIFE IN CAPTIVITY.

No record has been kept.

(55) THE BLACK-CRESTED MYNA.

(ÆTHIOPSAR CRISTATELLUS—(Linn.))

In shape and size it resembles the bank myna; the plumes of the nostrils are elevated into a crest; almost the entire plumage black, with green and purple reflexions; bill pale yellow; iris pale orange.

Hab.—China.

LENGTH OF LIFE IN CAPTIVITY.

Specimens have been living in the garden for the last five or six years.

All the above mynas may be treated in captivity like the common myna, which they all resemble in habits.

(56) THE PIED MYNA.

(STURNOPASTOR CONTRA—(Linn.))

Hindi—*Ablak myna*. Bengali—*Gosalik* or *Guia salik*.

Hab.—Very common in Bengal, up to the foot of the Himalayas; Sylhet, Cachar, and Khasia Hills; also found in the Central Provinces and parts of Upper India, but unknown in its south and west coasts.

LENGTH OF LIFE IN CAPTIVITY.

Although there is no record of the actual period during which a particular specimen has lived in the garden, they are known to bear captivity well.

TREATMENT IN HEALTH.

With regard to *housing* and *feeding*, they may be treated like the common myna. They do better when a number of them are kept together in a large aviary.

Breeding.—These birds in a wild state regularly breed in the garden, generally building their nest on cotton, peepul and tamarind trees, and laying three or four eggs. Until after the next autumn moult the young birds remain a dirty brown in colour. The breeding season is from May to about the middle of August. A curious instance of the usurpation of an unfinished crow's nest by a pair of pied mynas lately happened in this garden.

OBSERVATIONS ON THE HABITS OF THE PIED MYNA.

The pied mynas are fond of associating in flocks, and neither in their wild state nor in captivity are they timid birds. They feed much on the ground; when caged and tamed they learn to sing, whistle and even imitate other birds. They appear to be less fussy than the common myna.

(57) THE COMMON PIED BUSH CHAT.

(PRATINCOLA CAPRATA—(Linn.))

Hindi and Bengali—*Peddha*.

Description.—The general colour of the plumage black; a stripe on the wings, upper tail-coverts, middle of the abdomen, vent, and under tail-coverts, white.

The female, dusky brown; rump and upper tail-coverts rufous brown, beneath pale reddish-brown. The males vary in shades of colour somewhat according to season; length about 5 inches; bill black, legs brown black.

Hab.—It is found almost all over India, extending to Burmah and the Malayan countries and the Philippines; it is rather less common in the delta of Bengal.

LENGTH OF LIFE IN CAPTIVITY.

Although specimens have now and then belonged to the garden, they have not, as a rule, done well in captivity here, so that there is no record of the period during which one has lived in this garden.

TREATMENT IN HEALTH.

Generally speaking, the common pied bush chat requires the same care and treatment with regard to its *housing* and *feeding* as the "Shama" (No. 59).

(58) THE MAGPIE ROBIN.

(COPSYCHUS SAULARIS—(Linn.))

Hindi and Bengali—*Dayal*.

The dayal is such a well-known bird in Bengal that no description is necessary.

Hab.—Throughout the whole of India, ascending the Himalayas up about 5,000 feet, and extending to Tenasserim and Ceylon.

LENGTH OF LIFE IN CAPTIVITY.

As they are extremely common in Bengal, and as numbers of them are living within the garden in a semi-domesticated state, no serious attempt has ever been made to exhibit them in captivity. Adult birds should not be caged, as they do not bear captivity at all.

TREATMENT IN HEALTH.

May be treated like the "Shama" (No. 59).

Breeding.—The magpie robins breed in this garden in a wild state from April to July; they build their nests in holes of trees or hollows formed by the parting of branches; their favourite trees appear to be the following:—mango, peepul, tamarind, and kadam (*Nauclea kadamba*). A pair of these birds building in a mango tree close to an aquatic birds' tank were observed to carry off the cast-away down of the swans and other birds.

(59) THE SHAMA.

(CITTOCINCLA MACROURA—(*Gmel.*))

No description is necessary.

Hab.—"The Shama is a permanent resident of the warm and well-watered jungles of the Peninsula of India and Burma" (Hume). Except in the Terai at the foot of the North-West Himalayas, it is unknown in the North-Western Provinces of India. Those brought to Calcutta are generally from Midnapore, Cuttack and Western Bengal. Specimens are sometimes brought down from Goruckpore in the Terai and the Doons; it is scarce in the delta of Bengal, but common in the hill tracts of Assam, Sylhet, Burmah, Malacca, and even Ceylon.

LENGTH OF LIFE IN CAPTIVITY.

One of the specimens obtained in 1888 is still alive and well.

TREATMENT IN HEALTH.

Although it has from time to time been kept in a large aviary with tolerable success, it should, as a general rule, be treated as a cage-bird, and for this purpose a light bamboo cage should be preferred. The practice of covering the shama cages and those of other singing birds with a piece of cloth, so generally adopted in India for the purpose, no doubt, of inducing them to sing at night, has been found to be very beneficial, especially during the winter. It conduces much to the health and liveliness of the bird if the cage containing it be taken out every evening for an airing. Shamas should be kept singly.

Food.—In captivity its food consists of satoo, prepared with boiled ghi, grasshoppers and maggots. The latter should be perfectly free from the dirt in which they breed and live. During the winter and rains, meat may be given as a substitute for, or in addition to, maggots; it should be minced fine and thoroughly washed, and made into very small pellets: another, and better way of giving it, is to divide the minced meat into tiny lumps, each small enough to be picked up at a time, and stick them between the wire of the cage in several places.

Shamas do not breed in captivity.

TREATMENT IN SICKNESS.

Shamas have been known to suffer from *debility* and *emaciation* as the effect probably of age and confinement. Of the two cases that came

under observation, one terminated fatally, the other recovered. The proper course in such a case is to feed the patient on satoo prepared with egg, and put in a few drops of syrup of lactate of iron in its drinking-water.

Bad moulting is not unfrequent in shamas in captivity, and it is therefore advisable to pay extra attention when the process is going on; besides the usual satoo and insects, it should have every now and then, while moulting, a little boiled egg mixed with the satoo. Cold and draughts should also be carefully guarded against.

Shamas have also been found to suffer from a kind of *warty growth* in their legs and feet. When in this condition they can hardly sit on their perch. Before any treatment is attempted the perch should be covered with lint or flannel to make it soft, and enable the bird to sit with tolerable comfort. The warts should be lightly painted with tincture of iodine.

OBSERVATIONS ON THE HABITS OF THE SHAMA.

The shama is remarkable for its charming song. Commencing from the spring until the beginning of the moulting season, it sings almost incessantly every day, especially before sunset. Every bird, however, does not possess the same power or melody.

(60) THE GREY-WINGED OUZEL.

(MERULA BOULBOUL—(*Lath.*))

Hindi and Bengali—*Kastura*.

Description.—Dark ashy-black in colour, with a large pale silvery ashy-grey wing spot; the female is much paler with rufescent-whitish wing spot; bill, orbits, and legs deep yellow; the total length of the bird is about 10 inches.

Hab.—It is found almost throughout the whole range of the Himalayas from 5,000 to 8,000 feet.

LENGTH OF LIFE IN CAPTIVITY.

About three years.

(61) GOULD'S OUZEL.

(MERULA GOULDI—*Verr.*)

It resembles the grey-winged ouzel in shape and size; the colour of the head and neck dull black; throat pale black; wings and tail also dull black; the rest of the body bright rufous-brown; bill pale yellow; legs and feet yellowish.

Hab.—China.

LENGTH OF LIFE IN CAPTIVITY.

About thirteen months.

TREATMENT IN HEALTH.

Housing.—The grey-winged ouzel is often caged in Upper India and in Bengal, but it does well in a large aviary also.

Food.—Insects, fruits and satoo.

OBSERVATIONS ON THE HABITS OF THE OUZELS.

Both the grey-winged and Gould's ouzels are somewhat shy birds, especially the latter, but they soon become tame and familiar. The grey-winged ouzel sings and whistles beautifully; both the species feed much on the ground.

(62) THE ORANGE-HEADED GROUND THRUSH.

(*GEOCICHLA CITRINA*—(*Lath.*))

Hindi and Bengali—*Dâmdâ*.

Description.—Head and lower plumage pale brownish-orange; upper plumage bluish-grey; a white spot on the wings; bill horny-black; legs flesh-coloured; total length about $8\frac{1}{2}$ inches.

Hab.—Throughout the whole extent of the lower ranges of the Himalayas; jungles of Northern and Central India, extending through Assam to Burmah; not uncommon during the winter and spring in certain parts of Bengal; sometimes brought to the Calcutta market from Midnapore, Bankoora, Pachamba and Deoghur.

LENGTH OF LIFE IN CAPTIVITY.

Above five years.

TREATMENT IN HEALTH.

Housing.—This bird does well both in large and small aviaries; the former are, where available, to be preferred; as it is rather shy and retiring in disposition, shrubs in pots or other means of shelter will be much appreciated.

Food.—Satoo and insects; in captivity it also eats fruits, bread, and other articles of food.

TREATMENT IN SICKNESS.

Cases of *diarrhœa* have been met with amongst these thrushes, probably brought on by overfeeding. No treatment has ever been attempted.

OBSERVATIONS ON THE HABITS OF THE ORANGE-HEADED GROUND THRUSH.

It is shy and unobtrusive; the specimens kept in this garden have been seldom seen, except when feeding, in the open spaces of their habitation, their favourite resorts being one or the other of the wooden stands, on which pots of ornamental shrubs are arranged; here, hidden away amidst the foliage, one or all may be seen sitting motionless for minutes together. The *geocichla*, however, is by no means an inactive bird, nor is it altogether devoid of social instincts.

(63) THE COMMON WEAVER-BIRD.

(PLOCEUS BAYA—*Blyth.*)Hindi and Bengali—*Baya* or *Babai*.

Hab.—The common weaver-bird is found throughout the whole of India, extending to Assam, Burmah, Ceylon and Malayana. Although a permanent resident in most parts of India, it is somewhat migratory in its habits, so that it has been known to desert a particular locality which it frequented for years; its wanderings, however, are confined within a comparatively limited area.

(64) THE BLACK-THROATED WEAVER-BIRD.

(PLOCEUS BENGALENSIS—*Linn.*)Bengali—*Kantamala baya* (*i.e.*, necklaced baya.)

Hab.—Different parts of Lower Bengal, extending to Assam, Tipperah, and parts of Burmah; it is less common about Calcutta and its neighbourhood than the preceding species; the contrary appears to be the case with regard to Eastern Bengal, where this species is more plentiful than the common *baya*.

LENGTH OF LIFE IN CAPTIVITY.

Both the *bayas*, especially the common weaver-birds, bear captivity well.

TREATMENT IN HEALTH.

Housing.—These birds are easy to accommodate; as a rule, they should be placed in a large aviary or in an extensive cage; to give them occupation and amusement tufts of jute, bundles of hay or palm-leaves should be provided; the common weaver-birds are not unfrequently, caged and tamed.

Food.—Consists principally of various kinds of seeds, but in captivity, and especially when caged and tamed, they learn to eat other things.

Breeding.—The common weaver-birds have, on one or two occasions, been known to build, or at least to attempt doing so, within their prison, but without success; this appeared to have been due chiefly to the presence of other birds, which destroyed the nests as often as begun. For further information on this subject, "Jerdon's Birds of India," volume II, page 343, and "Hume's Nests and Eggs," volume II, page 114, may be consulted.

(65) THE CRIMSON-CROWNED WEAVER-BIRD.

(EUPLECTES FLAMMICEPS—*Swinh.*)

The golden-yellow colour of the head disappears altogether during the period of moult, which is rather prolonged, lasting from three to four months.

Hab.—West Africa.

LENGTH OF LIFE IN CAPTIVITY.

About three years.

(66) THE PARADISE WHYDAH BIRD.

(*VIDUA PARADISEA*—(*Linn.*))

Description.—In form and size it resembles a Munia; the distinguishing characteristic of the birds of this genus is the extraordinary length of their tails; in this species a ruff also is developed.

Hab.—West Africa.

LENGTH OF LIFE IN CAPTIVITY.

About three years.

TREATMENT IN HEALTH.

Housing.—Both the crimson-crowned weaver and the Paradise whydah birds have done well in large side cages with such small and harmless companions as munias and Java sparrows.

Food.—Seeds of various kinds.

OBSERVATIONS ON THEIR HABITS.

The crimson-crowned weaver-bird is very shy, the Paradise whydah is restless, active, and to a certain extent sociable. While restlessly moving about from perch to perch, the latter has the curious habit of constantly raising its head and looking up to the roof of the cage.

(67) THE BLACK-HEADED MUNIA.

(*MUNIA MALACCA*—(*Linn.*))

All the munias that have from time to time been exhibited in the garden are extremely common and familiar birds in Lower Bengal, and therefore no description is necessary for any of them.

Hab.—Southern and Central India and Ceylon, rarely Bengal.

(68) THE CHESTNUT-BELLIED MUNIA.)

(*MUNIA ATRICAPILLA*—(*Vieill.*))

Hab.—Throughout Bengal and the foot and the lower ranges of the Himalayas; rare in Southern India, though specimens are sometimes met with in the eastern coast of Madras; Ceylon and Tenasserim; numbers of them occur within a few miles of Calcutta, where stragglers are generally found.

(69) THE WHITE-BACKED MUNIA.

(UROLONCHA STRIATA—(Linn.))

Bengali—*Shikari munia*.

Hab.—Chiefly Southern India, though not uncommon in Lower Bengal, Arracan and Ceylon.

(70) THE SPOTTED MUNIA.

(UROLONCHA PUNCTULATA—(Linn.))

Hindi and Bengali—*Tilia munia*, *sabz munia*.

Hab.—Distributed throughout India and Ceylon, extending to Assam, Burmah, and Tenasserim; numbers of them are found in the drier parts of Lower Bengal.

(71) THE INDIAN RED MUNIA.

(SPORÆGINTHUS AMANDAVA—(Linn.))

Hindi and Bengali—*Lâl* or *Lâl Munia*.

Hab.—Abundant in Lower Bengal and North-Western India and the lower ranges of the Himalayas, extending to Assam and Burmah; somewhat rare in Southern India.

LENGTH OF LIFE IN CAPTIVITY.

Some may have lived in the garden for three years or more, but no record of the individual specimens has been kept.

TREATMENT IN HEALTH.

Housing.—Munias may be kept in large sized cages, and generally treated like the red-billed liothrix (No. 23). They, especially the Indian red species, are sometimes kept in very small cages and tamed.

Food.—Various kinds of seeds, especially kangni (*Panicum italicum*); in captivity they learn to eat fruits and bread and milk.

OBSERVATIONS ON THE HABITS OF A MUNIA.

Munias are extremely restless and playful birds, and are never silent during the day, but always chirping; the red munia sometimes whistles beautifully; they are generally very sociable.

(72) THE JAVA SPARROW.

(PADDA ORYZIVORA—(Linn.))

Description.—In size slightly larger than the munia, bill thick, conical and stout, and of a cherry-red colour; the prevailing colour of

the plumage albescent ashy, with conspicuous white cheek spots; a white variety is also common.

Hab.—Java, Sumatra, Malacca, Lombock, the Philippines, and southern provinces of China.

LENGTH OF LIFE IN CAPTIVITY.

About six years; but it is difficult, where a number of small birds of the same species, acquired at different times, are kept, to determine individual identity.

TREATMENT IN HEALTH.

With regard to *housing* and *feeding*, the Java sparrow may be treated like the munia, but as it is a hardy bird, capable of holding its own with others, it may also be kept in a large aviary.

(73) THE BLACK-TAILED GROSBEAK.

(CROCCOTHRAUSTES MELANURUS—(*Swinh.*))

Description.—The total length of the bird is about 9 inches, bill stout, conical, and of a yellow colour with greenish apex; head, neck, and chin black; the prevailing colour of the upper plumage greyish-brown; chest whitish-grey; abdomen yellowish-brown; wing black with white tips; tail black and forked.

Hab.—Common in Central and Southern China.

LENGTH OF LIFE IN CAPTIVITY.

About three years and more.

(74) THE ROSE-BREASTED GROSBEAK.

(HEDYMELES LUDOVICIANUS—(*Linn.*))

Prevailing colour of the plumage greyish-brown or black, head and neck, black; breast rose-coloured; total length about 10 inches.

Hab.—North America.

LENGTH OF LIFE IN CAPTIVITY.

About thirteen months.

(75) THE CARDINAL GROSBEAK.

(CARDINALIS VIRGINIANUS—(*Briss.*))

Of a bright red colour, subcrested; total length about 10 inches; a black band across the forehead and throat.

Hab.—Extends from the Southern United States through Mexico to Yactan and Belize.

LENGTH OF LIFE IN CAPTIVITY.

About three years.

Housing.—The grosbeaks do well in a large aviary; the cardinal grosbeak is shy, and like any other bird of that nature requires watching for the first few days, whether it feeds properly while living with others.

Food.—In captivity they flourish on fruits and grains and soon become accustomed to feed on other kinds of food to which they are perhaps strangers in their wild state; they have been frequently observed to devour satoo and bread and milk with equal relish.

(76) THE COMMON ROSE FINCH.

(CARPODACUS ERYTHRINUS—(Pall.))

Hindi—*Tuti*.

Description.—The head, throat, breast, rump, and the flanks of the abdomen, of a roseate colour, deeper about the head and neck; upper plumage generally brown; the breeding plumage, which they assume about the end of spring, is almost crimson; the colour is generally very subdued in those that have lived some time in captivity; the total length of the bird is about $5\frac{1}{2}$ inches.

Hab.—During the winter it is found almost all over India, rarer towards the south, but common in Northern India, the Terai, and the Himalayas, extending to Assam and Arracan; it is also found over the greater part of Central and Northern Asia and Europe.

LENGTH OF LIFE IN CAPTIVITY.

Roughly speaking, about four years.

TREATMENT IN HEALTH.

With regard to *housing* and *feeding* it may be treated like the Java sparrow and red-billed liothrix.

OBSERVATIONS ON ITS HABITS.

Sociable and restless; fond of congregating together; has a pleasing note.

(77) THE HOUSE SPARROW.

(PASSER DOMESTICUS—(Linn.))

Hindi—*Gowriya*. Bengali—*Chadai* or *Chata*.

Hab.—The house sparrow is found almost all over India, abundantly in most parts, more rarely in some, as the Malabar Coast in the south and in other places where the rainfall is great; it ascends the Himalayas up to a moderate height, and extends to Assam, Arracan, Pegu, Siam and Ceylon. The food supplied to the animals in the garden evidently attracts enormous numbers of them within it.

(78) THE CHAFFINCH.

(FRINGILLA CÆLEBS—*Linn.*)

Description.—Top and sides of the head and nape slaty-blue, back dull-brown, with faint blackish streaks; the rump and the upper tail-coverts dull green; the tail feathers greyish-black, the outer ones being faintly white margined; the exposed parts of the wings blackish-brown; the wing-coverts black with conspicuous white patches; cheeks, throat, and the under parts generally reddish-brown; bill bluish-plumbaceous; total length about 6 inches.

Hab.—The chaffinch is found almost all over Europe, extending to Northern Africa in the south, and as far east as Beluchistan.

(79) THE GREENFINCH.

(LIGURINUS CHLORIS—(*Linn.*))

Description.—The prevailing colour of the upper plumage ashy-green; the chin and breast apple-green, brighter in the lower breast; the abdomen bright greenish yellow; wings blackish-brown, the basal portion of the primaries yellow, with generally a blackish-brown spot; the terminal portion of the tail feathers blackish-brown, the basal portion yellow; a large grey spot at the side of the head below the eyes; the iris hazel; total length about six inches; the females are somewhat smaller and much less brightly coloured, being generally ashy-brown, tinged with greenish, the abdomen somewhat albescent.

Hab.—The greenfinch or the green linnet, as it is popularly called, is distributed throughout the whole of Europe, except the extreme north; it extends as far south as the west side of North Africa, and eastward as far as the Ural mountains.

(80) THE GOLDFINCH.

(CARDUELIS ELEGANS—*Steph.*)

Description.—The distinguishing characteristics of the goldfinch are its scarlet crown and throat, and the bright yellow of the basal portion of the wing; the hinder part of the crown, the nape, and a crescent-shaped band from the nape to the side of the neck black; the parts immediately at the base of the beak, and round and in front of the eye also black, but this is not conspicuous when viewed from a distance; the lower throat below the scarlet and the sides of the head, between the black and scarlet, white, and so is also a small triangular space on the hind neck immediately below the black; back, sides, and the breast bright brown; the lesser wing-coverts black; the greater wing-coverts, and the basal half of the quills bright yellow at their exposed parts, the terminal half black with white tips; the tail-feathers black; the two central feathers white-tipped; some of the outer tail-feathers having elongated white marks near the tip of the inner webs; the female is much duller in colour, the red of the forehead and throat much less or none; total length about five inches.

Hab.—Found almost throughout the whole of Europe, excepting the high north; North-East and North-West Africa; Asia Minor, extending as far east as Turkistan.

(81) THE CANARY FINCH.

(*SERINUS CANARIUS*—(*Linn.*))

The canary finch is so well-known a bird that any description would be superfluous.

Hab.—Canary Islands.

LENGTH OF LIFE IN CAPTIVITY.

Although specimens have occasionally been kept on deposit, canaries are not generally exhibited, and no record has therefore been kept of the period during which any specimen has actually lived in the garden; it is well known that they thrive perfectly in captivity.

(82) THE LINNET.

(*LINOTA CANNABINA*—(*Linn.*))

Description.—The general colour of the plumage above chestnut brown; the crown, hind neck, and sides of the neck brownish-grey; the chief characteristic of the bird is its crimson-red of the forehead and breast; total length about $5\frac{1}{2}$ inches.

Hab.—The linnnet is a very common bird throughout Europe, and is extensively distributed; besides Europe it is found in North Africa, Turkistan, the hills in Southern Persia, the Elburz Mountains, &c.

(83) THE MEALY REDPOLL.

(*LINOTA LINARIA*—(*Linn.*))

Description.—It resembles the preceding very closely, but differs in having the colour of its back blackish brown, the feathers being somewhat broadly margined with pale brown, and in some other minor details, as the extent of the crimson red of the breast, which in this species extends to the throat; the quills are not margined white, but brown or whitish brown; the crimson-red of the forehead is the same as in the linnnet; total length about 5 inches; the female differs from the male in having no red on the breast.

Hab.—The mealy redpoll has also a wide range of distribution, being found in Europe, Asia, as far as Japan; and North America, from the Atlantic to the Pacific.

(84) THE YELLOW BUNTING.

(*EMBERIZA CITRINELLA*—*Linn.*)

Description.—Head and the under parts generally citron yellow; the nape and back of the neck greenish; a chestnut brown moustachial stripe;

the forehead and sides marked with faint and narrow black lines; back fulvous-brown, and mottled; the rump and upper tail-covert bright brown with longitudinal faint black lines; wings rufous-brown, washed with greenish; the terminal portion of the quills dark brown; total length of the bird is about 6 inches; the female is somewhat smaller, and differs from the male in having no brown on the back and rump; the prevailing colour being a subdued greenish grey, mottled with dark stripes in the feathers.

Hab.—Common in Central Europe, from which it extends northward to Lapland and eastward to Siberia, becoming scarcer in Southern Europe.

(85) THE SKYLARK.

(*ALAUDA ARVENSIS*—(Linn.))

Hindi and Bengali—*Bharat* or *Bharat Pakshi*.

Description.—Sandy brown above with little deep brown markings to the feathers; the crown of the head slightly crested; feathers of the crest rounded; quills dark brown, edged narrowly with sandy brown; cheeks buffy-white, with minute deep brown spots; throat and chest brownish-white, marked with small brown specks; abdomen creamy white, so also the under surface of the tail; total length of the bird about $7\frac{1}{2}$ inches. The colour of its plumage varies much according to the season of the year; besides, there are several well-known forms of the common skylark, such as white, black and cream-coloured specimens.

Hab.—In India the skylark is found in the Himalayas, where it breeds at elevations from 8,000 to 10,000 feet, and its nests have also been found in Kooloo and Kashmir; also found in Ceylon, North China, Siberia, Palestine, Egypt, Northern Africa, British Islands and Europe generally. The specimens exhibited in this garden were from the British Islands.

(86) THE WOODLARK.

(*ALAUDA ARBOREA*—(Linn.))

Description.—Smaller than the preceding, and lighter in colour; a yellowish-white broad stripe commencing from behind each nostril passes behind to the nape, then passing downwards and forwards joins the white of the upper breast, thus enclosing an irregular triangular space at the side of the head including the eye; under parts yellowish white; sides of chin, throat, and breast spotted with dark brown; flanks striped; quills dark brown, edged with whitish; secondaries tipped and edged with dull rufous; tail dark brown; the outer feather on each side tipped and the outer web bordered white; the total length is about 5·5 inches.

Hab.—Central and Southern Europe, extending eastward as far as the Ural Mountains; is always present in England, though rarer in some parts than in others.

Observations.—These birds (Nos. 78 to 86) were, with the exception of the canary finch, imported from England, and they differed somewhat

from the descriptions here given, most of them being paler; the scarlet on the crown and neck of the goldfinch was subdued.

LENGTH OF LIFE IN CAPTIVITY.

Of these English birds, the greenfinch, linnet, and the mealy redpoll lived the longest—about fourteen months: the others died within a few months after their arrival.

TREATMENT IN HEALTH.

Housing.—Most of them do well in small cages, but larger ones should be preferred; in the hot moist climate of Lower Bengal care should be taken to keep them in a cool and airy place, especially during the summer; the least neglect in this respect is likely to be attended with fatal consequences; all of them must have ready access to water, both for drinking and bathing; when there are a number of them, either of one or of several species, they can be suitably accommodated in large cages, and, if necessary, with such small and harmless birds as Java sparrows, munias, red-billed liothrix, &c.; they would probably also do well in a lofty, spacious and well-ventilated aviary; but, wherever they are placed, light, shade and coolness should be the primary considerations; new arrivals should not be placed with the older inmates of a cage or an aviary, and birds of the same or different species which have hitherto lived separately should not be mixed up, without giving them an opportunity of becoming accustomed to one another's presence. The goldfinch, linnet, and skylark are capital cage-birds even in the climate of Bengal; the bottom of the habitation of these birds, whether it be a small cage or a large aviary, should have clean sand sprinkled over it.

Food.—All these birds thrive on seeds of various kinds, and most of them require insects and maggots as well; some are particularly fond of oily seeds, such as the chaffinch, linnet, goldfinch; for these mustard and hempseeds, in addition to various other kinds, should be provided; the chaffinch is also fond of insects and maggots; some of them, especially the skylark, have been observed to show great partiality for moong grain (*Phaseolus mungo*); the skylark and woodlark eat fruits and berries as well; they are all fond of vegetables, which should be plentifully supplied.

Transport.—The best time to import these birds into the plains of India is the cold weather.

TREATMENT IN SICKNESS.

The suddenness with which some of these British birds died, and the season of the year at which these deaths mostly occurred, favour the belief that, in the majority of cases at least, *heat apoplexy* was the cause of death; unfortunately no autopsy was held.

OBSERVATIONS ON THE HABITS OF THESE BRITISH BIRDS.

The linnet and the goldfinch appeared to be the most lively, tractable and engaging of all these birds.

(87) THE BENGAL BUSHLARK.

MIRAFRA ASSAMICA—*McClell.*)Hindi—*Aggin; Bhiriri.*

Description.—The prevailing colour of the upper plumage ashy-brown, in some specimens and according to the locality, with a tinge of olive; throat whitish; breast and abdomen brownish-white and spotted; total length about $5\frac{1}{2}$ inches.

Hab.—Throughout Lower and Eastern Bengal, in the better-watered and wooded tracts of the Central Provinces and Chota Nagpore, in Assam and Cachar, and in the Dhoons and Terai which lie at the feet of the Himalayas, and the immediately adjacent districts of Behar, Oudh, and the North-Western Provinces. (*Hume.*)

(88) THE SINGING BUSHLARK.

(MIRAFRA CANTILLANS—*Jerdon.*)Hindi—*Agghin.*

Description.—It closely resembles the preceding species, but has more white about the throat and below the ear-coverts; underparts pale rufescent with indistinct small breast spots; total length about $5\frac{1}{2}$ inches.

Hab.—The singing bushlark is found throughout India, common in some parts, rarer in others, not so common in Lower Bengal as in most parts of Behar.

LENGTH OF LIFE IN CAPTIVITY.

Specimens of both the bushlarks have often been included in the collection of the garden, but no record has been kept of the length of their life in captivity.

TREATMENT IN HEALTH.

Housing.—In this garden they are allowed to remain in the large aviary, where they have more opportunity of hiding themselves under straw or amongst plants than in other places; as cage-birds they do well and are generally treated as such by the bird-fanciers in Bengal.

Food.—In captivity both these larks thrive well on satoo, insects and maggots; they also eat fruits.

OBSERVATIONS ON THE HABITS OF THE SINGING AND BENGAL
BUSHLARKS.

Both of them are uninteresting birds as specimens for exhibition in an aviary, as they can be seldom seen; they move swiftly on the ground and are always hiding; both of them sing well, especially the singing lark.

(89) THE SONG THRUSH.

(MERULA MUSICA—*Linn.*)

Description.—Dark olive-brown above, including the wing-coverts, the median and greater coverts tipped bright-buff; the head slightly washed with a yellowish hue; sides of the head and neck spotted and striped; under surface of the body whitish, the throat and upper breast being buff and spotted; total length about 8 inches; the bird is subject to great variation.

Hab.—Found everywhere in England and Scotland and throughout Europe, Northern Africa and Arabia.

(90) THE BLACK-BIRD.

(MERULA MERULA—(*Linn.*))

Description.—Adult male, silky black; the wings somewhat paler; bill orange; eyelid orange; total length about 10 inches. The birds exhibited in this garden were much paler.

Hab.—With the exception of the extreme north it is found almost all over Europe, especially in the South, North-Eastern Africa, extending as far east as Persia.

(91) THE INDIAN PITTA, OR YELLOW-BREASTED GROUND THRUSH.

(PITTA BRACHYURA—(*Linn.*))Hindi—*Nawrang*. Bengali—*Shumcha*.

Description.—Head fulvous or fulvous-brown, with olive tinge; a black stripe from the base of the bill to the back of the neck, meeting another black band which passes through the ears; a faint white superciliary line extending to the nape; the upper plumage dull bluish-green; quills black with white tips, and white bars to some of the primaries; a bluish patch on the shoulder; tail black, tipped with dull blue; chin, throat, and sides of the neck, white; the chest and the flanks fulvescent; the middle of the lower part of the abdomen, vent, and the under tail-coverts scarlet; bill black; legs pinkish-yellow. In the specimens exhibited in this garden the scarlet of the abdomen was very subdued.

Hab.—Found throughout the whole of India, common in certain tracts and scarcer in others; nowhere, however, very abundant; scarce in the delta of Bengal, where they are chiefly immigrants. Common in the Central Provinces and Southern India. The pitta is also found in Ceylon.

LENGTH OF LIFE IN CAPTIVITY.

The longest period during which an Indian pitta has lived in the garden has been about four years.

TREATMENT IN HEALTH.

With respect to *housing* and *feeding* it may be treated like a geocichla (No. 62).

OBSERVATIONS ON THE HABITS OF THE INDIAN PITTA.

Like the geocichla, a pitta is a shy and solitary bird, scarcely associating with others, and seldom amusing itself in any way. In this respect it is perhaps less interesting than a geocichla; it is generally very silent.

(92) THE GREEN-BREASTED PITTA.

(PITTA CUCULLATA—Hartlaub.)

Description.—A green bird, with the chin, throat, sides of the head and the neck all round black; the crown of the head dark rufous-brown; the upper tail-coverts and part of the wings verdigris-blue; primaries black, with a conspicuous white patch; the vent and under tail-coverts scarlet; length about 7 inches.

Hab.—Found in Nepal, Sikhim, Assam, Burmah and the Malayan peninsula.

A specimen lived for about two months only.

(93) THE GOLD-BACKED WOODPECKER.

(BRACHYPTERNUS AURANTIUS—(Linn.))

In Lower Bengal all the birds of this group are known as *kāt-tokrā*, woodpeckers. The gold-backed woodpecker is so well-known in Bengal that no description is needed.

Hab.—Found almost throughout the whole of India, including the lower ranges of the Himalayas; the northern parts of Ceylon, British Burmah, the Indo-Burmese countries and the Malayan peninsula.

LENGTH OF LIFE IN CAPTIVITY.

About six to seven months.

TREATMENT IN HEALTH.

Housing.—A large aviary is by far the best accommodation for a woodpecker; here it may have some chance of indulging in its favourite habit of tapping, if not a living tree, at least a dead one, to procure its food; but, howsoever suitable the accommodation may be, a woodpecker is always an intractable bird in captivity. In selecting stock, younger birds should be preferred, as they can be taught to feed on prepared food with comparative ease; as long as they are not so trained, they should, of course, be kept separately.

Food.—In captivity young birds may be trained to feed on satoo, minced meat and soft fruits, but insects and maggots are indispensable; satoo should be soft and semi-liquid, and may be prepared with eggs, raw or half-boiled, and finely minced meat.

Breeding.—Woodpeckers have never bred in captivity, but sometimes, though rarely, wild birds build and lay within the garden. The mango and kadam appear to be their favourite trees for building, but on one occasion a pair were found to lay in a hole in the trunk of a cocoanut palm; they were of course usurpers, the hole having been made by some barbets.

OBSERVATIONS ON THE HABIT OF THE WOODPECKER.

The woodpecker being a climbing bird, as soon as one is placed in an aviary, it ascends by the wire netting of the cage, but not being so adept in moving down as in climbing up, it remains adhering to the wire almost at the very top of the cage, until helped down by a keeper. Tamer birds soon take to tapping the dead trees inside an aviary. It is interesting to observe a woodpecker feeding; it licks up its food with its long vermiform tongue, the tip of which is furnished with tiny recurved spines.

(94) THE WRYNECK.

(IYNX TORQUILLA—(Linn.))

The wryneck is found in most parts of India; more common in Western than in Lower Bengal.

The only specimen ever obtained for the garden did not survive more than a week; it is a difficult bird to keep in captivity, owing to its peculiar habit of procuring food while on the wing.

(95) THE GREAT INDIAN BARBET.

(MEGALEMA MARSHALLORUM—Swinh.)

Description.—The whole head, including the nape and neck, violet blue; upper part of the back coppery brown; the lower back, rump and upper tail-coverts light green, which in a very healthy specimen is glossy; parts of the wing have yellowish patches; tail green, with faint bluish tinge; breast brown; abdomen pale yellow, with brown streaks or blotches; under tail-coverts crimson, bill yellow; total length about 13 inches.

Hab.—Throughout the Himalayas, extending through Assam to China; these birds are generally brought down to Calcutta from Bhutan and Sikkim.

LENGTH OF LIFE IN CAPTIVITY.

A specimen has been living in the garden for the last five years.

(96) THE BLUE-FACED BARBET.

(CYANOPS ASIATICA—(Lath.))

Bengali—*Basanta-bairi*, in some parts of Bengal.

This bird is readily distinguished from other barbets by its red cap with the black band across; its blue face and throat, and the bright

crimson spots on either side of the base of the foreneck; the sexes are almost alike, the female being somewhat smaller than the male.

Hab.—"Indo-Burman sub-region, having been found to the westward as far as the valley of the Jumna, and to the eastward extending to Arracan." *Hume*. Very common in Calcutta and its neighbourhood, as well as in other parts of Bengal.

LENGTH OF LIFE IN CAPTIVITY.

Specimens are always living in the garden, but there is no record of the history of any single individual.

(97) THE LINEATED BARBET.

(*CYANOPS LINEATA*—(*Vieill.*))

Bengali—*Corul*, amongst the bird-catchers of Bengal.

Description.—Prevailing colour green, paler on the flanks and abdomen; vent and lower tail-coverts yellowish; all about the head and upper breast whitish, the feathers of the crown and nape being medially streaked white; those of the sides of the neck, breast, and abdomen also margined whitish brown; bill orange brown, total length about $10\frac{1}{2}$ inches.

Hab.—The lineated barbet inhabits the whole extent of the Sub-Himalayan region from the Sutlej Valley to the Brahmaputra, ascending the Himalayas up to about 3,000 feet; it has been recorded from Sylhet, Pegu, and Tenasserim.

LENGTH OF LIFE IN CAPTIVITY.

These birds have been found to thrive well in captivity in Lower Bengal, so that one of those now living in the collection has been there for more than seven years.

(98) THE CRIMSON-BREASTED BARBET.

(*XANTHOLÆMA HÆMACEPHALA*—(*Mull.*))

Bengali—*Chota Basanta baire*.

The "Copper-smith" bird of Europeans in India.

Like the blue-faced barbet, this bird is also well known in Lower Bengal; its total length is about $6\frac{1}{2}$ inches; its distinctive characteristic is the crimson colour of its frontal space and the pectoral gorget.

Hab.—Found throughout the plains of India, Burmah, Malayana, Ceylon, &c.; common in Calcutta and the neighbourhood.

LENGTH OF LIFE IN CAPTIVITY.

The same remark which has been made with respect to the blue-faced barbet applies to this also.

TREATMENT IN HEALTH.

Housing.—All of them have been found to do well in a large aviary; the great Indian barbet takes no little time to become thoroughly acclimatised in the plains; for the first few months it looks shabby and even sickly, so that it is undesirable to introduce it on arrival straight into a place where it must hold its own with other birds.

Food.—Consists of fruits, seeds, buds and insects; in captivity they thrive excellently on satoo, plantains and other fruits and minced meat.

Breeding.—None of them have ever bred in captivity, but both the blue-faced and the crimson-breasted barbets often breed in a wild state within the garden, generally selecting a decayed branch of a tree, in which they find it easy to make holes. On one occasion a number of them bred in a cocoanut-palm grove: the breeding season lasts from March to June.

Transport.—If it can be helped, the great Indian barbet should not be brought down to the plains during the summer or even in the rains; early in winter is the proper time to bring it down from the hills.

TREATMENT IN SICKNESS.

Nothing particular is known about their ailments; they often die from causes which are common to most other birds.

OBSERVATION ON THE HABITS OF BARBETS.

Barbets generally are arboreal in habits, but of the several species exhibited in this garden, the great Indian barbet appears to be the most fond of keeping to the topmost perch of the aviary, rarely, if ever, descending to the ground, or even to the lower perches; it is also an inactive bird, so that it may not be unfrequently seen sitting motionless in one place for hours together; its cry is loud and monotonous, but very characteristic. Once begun, it goes on calling for an hour or more; it is rather solitary in habits, and does not associate with other birds, either of the same or other species; the most active members of this group of birds are the crimson-breasted barbets; compared with their size, they have an extraordinarily loud note; the blue-faced barbets may sometimes be seen tapping hard at the dead trunk of a tree inside an aviary; none of the barbets have ever been noticed to climb like the woodpecker.

(99) THE EUROPEAN HOOPOE.

(UPUPA EPOPS—*Linn.*)

Hindi and Bengali—*Hud-hud*.

The characteristic feature of this bird is its large ornamental crest. As, however, the bird is well known, no description is necessary.

Hab.—Found in the Himalayas and various other parts of India, including Bengal; also in Assam, Burmah, and most other parts of Asia, Europe and North Africa.

During the rains and winter hoopoes may sometimes be seen within the garden in a wild state, and specimens have now and then been captured, and attempts made to tame them, but hitherto without success.

(100) THE INDIAN BLUE-ROCK PIGEON.

(COLUMBA INTERMEDIA—*Strickl.*)Hindi—*Kabutar*. Bengali—*Gola-Paira*.

Very common and abundant throughout India.

Hab.—India, including the Himalayas, Assam, Burmah and Ceylon; more common in open countries and in and near villages and towns than in forest tracts.

LENGTH OF LIFE IN CAPTIVITY.

Although there is no record of individual specimens, the blue-rock pigeons have been known to live long in this garden.

(101) THE WHITE-BELLIED PIGEON.

(COLUMBA LEUCONOTA—*Vig.*)

Description.—Head and face dull or ashy black; back of neck white; back light brownish grey; wings also the same colour; rump white; the primaries tipped with dull black; the secondaries tipped dusky; tertiaries barred with dusky bands and tipped grey; belly white; bill black; irides yellow; legs red; total length about 14 inches.

Hab.—North-West Himalayas. A specimen said to be from Sikhim has lately been obtained.

LENGTH OF LIFE IN CAPTIVITY.

A little over three years. Although inhabitants of very high altitudes, the specimens exhibited did not appear to suffer much during the hot weather.

(102) THE DARJEELING WOOD-PIGEON.

(PALUMBUS PULCHRICOLLIS—*Hodgs.*)

Description.—Total length about 14 inches; general colour dusky grey; light ashy about the head and cheeks; sides of the neck glossed green and purple; its distinctive characteristic consists of a patch of feathers on the neck, black at the base, isabelline at the edges, and white at the tips; throat whitish; breast green and purple; bill yellow at the tip; irides yellow; legs dull red.

Hab.—Nepal, Sikhim, and South-Eastern Himalayas generally.

LENGTH OF LIFE IN CAPTIVITY.

A specimen obtained in 1880 lived for a few months only.

(103) THE SPOTTED DOVE.

(TURTUR SURATENSIS—(*Gmel.*))Hindi—*Chitla*. Bengali—*Ghugu*.

Numbers of this extremely common dove live within the garden in a semi-domesticated state.

Hab.—Found all over India, up to about 7,000 feet in the Himalayas; also common in Ceylon.

LENGTH OF LIFE IN CAPTIVITY.

No record of individual specimens has been kept; it is known to bear captivity extremely well; some of those caged in 1878 are still alive.

(104) THE RED TURTLE DOVE.

(TURTUR HUMILIS—(*Temm.*))

(105) THE COMMON RING DOVE.

(TURTUR RISORIUS—(*Linn.*))

Both the red turtle and the common ring doves look very much alike at first sight. They differ, however, in general colour (which is vinous or brick-red in the former, and uniform light grey-brown in the latter), the extent of the collar, the comparative lengths of the tail and some other particulars; the sexes in the red turtle dove also differ.

Hab.—Both the species are found throughout India and Ceylon. None of them are common in Bengal. The red turtle-dove extends through Assam and Burmah to the Philippine Islands.

LENGTH OF LIFE IN CAPTIVITY.

Like the common spotted dove, these also bear captivity well.

(106) THE MALAY SPOTTED DOVE.

(TURTUR TIGRINUS—(*Temm.*))

Description.—Total length about 12 inches; general colour of the plumage above brown; feathers blackish along the shaft and tipped lighter brown; forehead and cheeks grey; a dark spot in front of the eye; crown, nape and lower plumage vinaceous; hind neck and sides of the neck black, each feather with two white spots at the tip; bill bluish-black; irides reddish; legs deep red.

Hab.—Burmese countries generally, Cochin China, the Malay peninsula, Sumatra, Java, Borneo, and even the distant islands of Celebes and Amboyna.

LENGTH OF LIFE IN CAPTIVITY.

No record.

(107) THE CHINESE TURTLE DOVE.

(*TURTUR CHINENSIS*—(*Scop.*))

Description.—Slightly larger than the former, and differing from it in having no dark shaft streaks on the upper plumage. This species appears to vary somewhat, some being much paler than others.

Hab.—China.

LENGTH OF LIFE IN CAPTIVITY.

As hardy as the other turtle doves mentioned above.

(108) THE RUFOUS TURTLE DOVE.

(*TURTUR MEENA*—(*Sykes.*))

Bengali—*Sham ghugu.*

Description.—The prevailing colour of the bird is vinaceous brown, the forehead and crown being washed with ashy; the chin and throat whitish; a black patch on either side of the neck, each feather being tipped with grey; the vinaceous brown colour is deepest on the breast, becoming much paler lower down and almost albescent on the abdomen; primaries edged with whitish; total length about 12 inches. Those from Burmah appear to be somewhat larger than the Northern Indian and the Himalayan specimens.

Hab.—Burmah, the hill tracts of Eastern Bengal, the foot of the Himalayas, Central India and Bombay.

LENGTH OF LIFE IN CAPTIVITY.

About eight years.

(109) THE BAR-TAILED CUCKOO DOVE.

(*MACROPYGIA LEPTOGRAMMICA*—(*Temm.*))

Description.—The upper plumage dusky black, barred with rufous; breast vinous brown or ashy with a vinous tinge; each feather barred with subdued metallic green; forehead and chin buff; crown of the head, nape, and sides of the head vinaceous, with a gloss of metallic green; the central tail feathers black, barred with rufous, the next two pairs barred with indistinct black and rufous at the end; the three

outer pairs ashy, with a black subterminal band; vent and undertail-coverts buff. In the female the bars are more developed and the colours less conspicuous; the breast and abdomen barred with brown; total length about 15 inches; the legs brownish red; bill horny-brown.

Hab.—South-East Himalayas, extending through Nepal and Bhutan to the Khasia hills; Burmah and through Malay peninsula to Java.

The single specimen obtained for the garden did not survive more than a month.

(110) THE CRESTED PIGEON.

(OCYPHAPS LOPHOTES—(Temm.))

Description.—Slightly larger than the common spotted dove (No. 103); head, face, throat, breast and abdomen delicate ashy grey; the occipital crest, which is long, pointed and directed backward, black, the length of the plumes diminishing towards the back; back of the neck, back and sides brown, washed with olive; wings variegated; tail feathers tipped with white.

Hab.—Australia. It affects marshy tracts in preference to others.

LENGTH OF LIFE IN CAPTIVITY.

A pair have been living since 1880.

(111) THE EMERALD DOVE.

(CHALCOPHAPS INDICA—(Linn.))

Bengali—*Ram ghugu*.

It is popularly known as the bronze-winged green dove, and in the Calcutta bird market it is not unfrequently called the coral-beaked dove.

Hab.—All over India, Ceylon, the Andamans, Burmah, Southern China, Cochin China, Siam, the Malayan peninsula, and almost all the islands of the Malay Archipelago.

LENGTH OF LIFE IN CAPTIVITY.

Like most other animals, the mortality is great amongst the new arrivals, but those that once become reconciled to confinement live long and well. Among the large number now exhibited, some have been living since 1880 or 1881.

(112) THE BRONZE-WINGED PIGEON.

(PHAPS CHALCOPHTERA—(Lath.))

Description.—Forehead dirty buff; a curvilinear line under the eye and the chin yellowish white; crown of the head and occiput dark brown; sides of the neck grey; back of the head and all the upper surface brown; wings brown with paler edges; a patch of coppery

bronze on each wing covert; the central tail feathers brown, others grey, with a band of black near the tip; breast very delicate light chocolate.

Hab.—Australia.

LENGTH OF LIFE IN CAPTIVITY.

A pair have been living since 1883.

(113) THE WONGA WONGA PIGEON.

(*LEUCOSARCIA PICTA*—(*Lath.*))

Description.—Total length about 16 inches; head and chin white; the nape, back, rump, wings and tail, in fact the whole upper surface, slaty grey; primaries brown; breast greyish black with a broad white band across; the abdomen and flanks white, each feather of the latter marked with a triangular black spot; irides dark brown, surrounded by a narrow pink red line.

Hab.—New South Wales.

Specimens living since December 1887.

(114) THE BLOOD-BREADED PIGEON.

(*PHLOGÆNAS CRUENTATA*—(*Lath.*))

Description.—Total length about 13 inches; the whole upper part slaty grey with delicate purple reflexions; throat and breast white; the rest of the under surface of a cinnamon colour; the most characteristic feature of the bird is a blood-red patch at the centre of the breast

Hab.—The Philippine Islands.

LENGTH OF LIFE IN CAPTIVITY.

Though very delicate, they seem to do remarkably well after they have once recovered from the effects of a long voyage. One of the birds now living has been in the garden since 1880.

(115) THE PEACEFUL DOVE.

(*GEOPELIA TRANQUILLA*—*Gould.*)

Description.—Total length about 9 inches; the prevailing colour of the bird ashy grey; occiput, back and wings ashy brown; abdomen and flanks vinous; chest, sides and back of the neck crossed by numerous very narrow bands of black; the outer tail feathers tipped with white; irides ashy grey.

Hab.—Australia; interior of the country northward from New South Wales.

LENGTH OF LIFE IN CAPTIVITY.

Living since 1884.

(116) THE HACKLED GROUND PIGEON.

(CALÆNAS NICOBARICA—(Linn.))

Description.—Head and neck slaty grey or greyish black ; the tail and the tail-coverts white ; the rest of the plumage, with minor exceptions, green with metallic reflexions ; the distinguishing characteristic of this species is its thick bunch of hackles, which from the base of the occiput and the back of the neck flow down on to the body ; those from the occiput are more or less hairlike ; total length about $15\frac{1}{2}$ to 16 inches.

Hab.—Nicobar Islands principally, but also found in the Andaman group. Some authorities say that it is found in Mergui and the Malay peninsula, but others deny this.

LENGTH OF LIFE IN CAPTIVITY.

The longest period during which one has as yet lived in the garden has been over nine years.

(117) THE COMMON CROWNED PIGEON.

(GOURA CORONATA—(Linn.))

Description.—Of large size and massive and rounded form ; prevailing colour of the plumage pale blue ; wing-coverts maroon-lilac with coppery-bronze reflexions, with a white band across ; a band of the same colour and reflexions stretches across the back also ; tail tipped with bluish white ; the most characteristic feature of the species is its large, prominent and beautiful crest, which, commencing from the middle of the forehead, is continued down in a line to the middle of the occiput ; it consists of about fourteen plumes, and viewed from the sides looks like the upstretched train of a peacock without the ocelli ; irides crimson ; the scutillæ of the starsus very prominent.

Hab.—New Guinea.

LENGTH OF LIFE IN CAPTIVITY.

They appear to bear captivity extremely well, as most of those now exhibited have been living since 1879.

(118) THE VICTORIA CROWNED PIGEON.

(GOURA VICTORIÆ—Fraser.)

Description.—In size, form, bulk and general colour the same as the preceding species. It differs from the latter in the following respects—breast lilac-brown with coppery reflexions ; band on the

wing-coverts faint blue instead of white; no maroon-coloured band on the back; crest adorned with white eyelets.

Hab.—New Guinea and adjacent islands.

LENGTH OF LIFE IN CAPTIVITY.

Specimens living since 1880.

(119) THE IMPERIAL GREEN PIGEON.

(CARPOPHAGA ÆNEA—(Linn.))

Description.—Head, neck, chest and rest of the under plumage grey; base of the bill and chin white or whitish; back and rest of the upper plumage glossy green with coppery reflexions; primaries and secondaries greenish brown; iris red; bill grey; total length about 17 inches.

Hab.—Excepting the north-west, it is found in most other parts of India, extending through Burmah, the Indo-Burmese countries, and the Malay peninsula to Sumatra, Java, Borneo and the Philippines. In Bengal they are said to occur about Midnapore, but there is no authentic record of this.

LENGTH OF LIFE IN CAPTIVITY.

About three years.

(120) THE PIED IMPERIAL PIGEON.

(CARPOPHAGA BICOLOR—(Scop.))

Description.—Total length about $15\frac{1}{2}$ to 16 inches; general colour of the plumage white; primaries, secondaries and the terminal portion of the tail black; irides dark brown; legs and feet pale smalt blue. In fully adult and healthy specimens the nape and upper back is washed with delicate and faint lilac buff.

Hab.—Very widely distributed, being found in the Andamans, the Nicobars, the Malay peninsula, and all the islands of the Archipelago.

LENGTH OF LIFE IN CAPTIVITY.

Either owing to unsuitable habitation or some other cause, this species has not hitherto thriven well, so that no specimen has yet lived longer than three years. A few have been living for the last three years and six months, and as they look bright and happy, and apparently in first-rate health, and as, moreover, the habitation is a good one, it may be expected that they will live longer.

(121) THE BRONZED IMPERIAL PIGEON.

(CARPOPHAGA PERSPICILLATA—Temm.)

Description.—Forehead, crown, and sides of the head very delicate vinous ashy; chin white; nape, sides of the neck and upper breast ashy;

lower breast and abdomen almost the same colour as the crown and the forehead; back and wings greenish, feathers being margined brown with bronze reflexions; quills ashy black; tail also ashy black; under tail coverts cinereous brown; bill plumbeous white; iris brown; legs red; total length about 17 inches. The colour of the bill, tail feathers, and the amount of green with bronze reflexions, vary much in different individuals.

Hab.—Java, Borneo and Sumatra.

LENGTH OF LIFE IN CAPTIVITY.

Over three years.

(122) THE SUPERB FRUIT PIGEON.

(PTILOPUS SUPERBUS—*Temm.*)

Description.—Total length about 9 inches; head purple, chin and throat delicate ashy white; nape and sides of the neck orange, washed with rufous; breast ashy-grey with light purple tinge; a band of bluish-black stretches across the lower breast; abdomen white; upper parts, flanks, and thighs green; the flanks above the thighs crossed by a white band; shoulders and parts adjacent to it purple; primaries brownish-black; secondaries green edged with yellow; the outer tail feathers with a broad white band at the tip; bill olive green, with yellow tip; irides yellow; feet pink. The female is uniformly green above; throat, greyish-white; breast, greyish green.

Hab.—Australia, Ternate, Amboyna.

Other fruit-pigeons ascribed to this genus, but of which the specific identity has remained undetermined owing to their having arrived young or out of condition, have now and then been exhibited; none of them, however, have ever done well.

(123) THE THICK-BILLED GREEN PIGEON.

(TRERON NEPALENSIS—(*Hodgs.*))

Description.—Forehead and crown ashy; the prevailing colour of the rest of the plumage green of different shades and intensity; back, scapulars, and the greater part of the lesser wing coverts maroon; median wing coverts broadly edged with yellow, the outermost ones being tinged with blackish; greater coverts blackish, edged with yellow; primaries and their coverts black; the primary coverts narrowly edged with whitish; secondaries black, edged with yellow on the outer web, the outer tail feathers ashy, with a bar of black across. In the female there is no maroon on the back and scapulars; bill red at the base, yellow on culmen, rest green; legs bright red; iris blue. Total length about $9\frac{1}{2}$ to 10 inches.

Hab.—South-East Himalayas; the Indo-Burmese country; the Malay peninsula; Sumatra.

LENGTH OF LIFE IN CAPTIVITY.

There is no record of individual specimens, but the species has not yet done well in this garden.

(124) THE BENGAL GREEN PIGEON.

(CROCOPUS PHENICOPTERUS—(*Lath.*))

(125) THE SOUTHERN GREEN PIGEON.

(CROCOPUS CHLORIGASTER—(*Blyth.*))

Hindi and Bengali—*Harial*.

The harials are well-known birds in Lower Bengal. A Bengal green pigeon from Upper India differs from a southern green pigeon much more than one from Lower or Western Bengal. The harials from Lower Bengal are very deficient in the yellow tinge, which is generally well marked in Upper Indian specimens.

Hab.—The Bengal green pigeon is found all over Bengal and Upper India, extending eastward to Assam, Sylhet, Tipperah, &c., and as far south as the Nerbudda river. The southern green pigeon is found throughout the greater part of the peninsula of India, and Ceylon; not uncommon about Midnapore in Lower Bengal.

LENGTH OF LIFE IN CAPTIVITY.

Neither of the above species of green pigeons appears to bear captivity well. A few specimens have now and then been found to do well, but as a rule they do not live long in confinement.

(126) THE ORANGE-BREASTED GREEN PIGEON.

(OSMOTRERON BICINCTA—(*Jerdon.*))

Resembles a harial very closely, but smaller; legs red; has an orange buff patch on the breast.

Hab.—The greater part of peninsular India, Ceylon, Assam, Burmah, &c. It does not appear to be common in Lower Bengal.

LENGTH OF LIFE IN CAPTIVITY.

No record of individual specimens has been kept.

(127) THE KOKLA GREEN PIGEON.

(SPHENOCERCUS SPHENURUS—(*Vig.*))

Hindi—*Kokla*.

Description.—In general appearance it resembles a harial, but differs from it in having a ruddy tinge on the head and breast, and the scapulars and mantle maroon, and legs red. The female and young

birds have no ruddy tinge on the breast, but they can be readily distinguished from the green pigeons by the colour of the legs.

Hab.—Found throughout the Himalayas, from 4,000 to 8,000 feet, extending to the hill ranges of Assam and Sylhet. They descend to the plains in winter, returning to the hills in summer.

LENGTH OF LIFE IN CAPTIVITY.

Though denizens of a cold climate, they bear captivity in the plains of Bengal much better than the Bengal green pigeons (No. 124), which live in a wild state in the neighbourhood of the garden.

TREATMENT IN HEALTH.

Housing.—A columbarium or pigeonry with separate divisions for the accommodation of different groups of pigeons is no doubt the most desirable arrangement, and, when such a luxury is possible, a house of the following style (though by no means perfect) will be found to answer all practical purposes in this climate. A covered shed some 50 feet long, and about 12 feet broad, raised 3 feet above the level of the ground, should be divided into three or four compartments according to requirements. The back and sides of the shed should be solid brick wall, some 12 feet high from the ground, the front may be built of planks or stout wire-netting, with intervening pillars on which the sloping roof should rest; corresponding to each division of the covered shed, there should be open air flights enclosed all round with one-inch mesh wire-netting. Unless, however, the open air enclosure is built on a brick-on-edge platform, which need not be more than six inches above the ground level, the rats will be very troublesome. But, on the other hand, half the value and utility of such a place will be lost owing to the hard brick floor, which, besides being unsuitable for its hardness alone, will be very hot during the mid-day heat of the summer, and very cold in the winter mornings. As a compromise, however, between these two, about three or four inches of earth should be spread over half of it and doob grass laid, the remaining half being covered with gravel or sand. During the summer the wire roof of the outside portion should be covered with a thin thatch of ooloo grass; if the front of the covered portion be made of wire-netting, it should be protected with shutters during the cold winter nights. The house must, of course, be fitted up with the necessary perches, boxes, and nesting places, and other requisites of a bird-house. Various other styles may be adopted, but it is unnecessary to mention them. In this garden the pigeons are mostly accommodated in large aviaries by themselves or with other birds, and they generally thrive. The place for the Crown pigeons should be lofty and spacious, and the floor well sanded; being large and beautiful birds, they can never be seen to advantage unless the cage is proportionately large; if possible, they should have a retiring box so placed as to be perfectly screened from visitors. The Wonga Wonga pigeons are also fond of retirement, and appear to do well when placed by themselves; they should also have their retiring box in some sheltered corner and as high as possible. The blood-breasted pigeons are very delicate, but when they once become

reconciled to the new mode of life incidental to captivity, they live happily with other birds; here some of them hold their own with the bhimraj and chakur partridges—by no means perfectly harmless birds. The fruit pigeons, especially of the genus *Ptilopus*, are generally very delicate birds; they should be well protected from draughts and cold to which they are extremely susceptible. A large moveable cage will, perhaps, better accommodate the requirements of the latter, as it will admit of being put out in the sun, which they much require, especially of a cold wintry morning. A good bath should be provided for all.

Food.—The following is a list of the principal grains used for feeding pigeons:—Indian-corn, barley, wheat, moong, peas, hemp-seed, mustard-seed. All pigeons do not care for barley, though it is a good and nourishing food; Indian-corn mixed with other grains, such as wheat, barley and hemp-seed, makes capital food for the larger pigeons; the blood-breasted and the Australian crested pigeons appear to be particularly fond of moong, but they also eat other grains and fruits. In captivity most of the pigeons learn to eat bread, biscuits, boiled rice, &c. The soft-billed pigeons are fond of satoo, which may be especially prepared for them with plantains; for the fruit-eating kind the plantain is no doubt very good, and is always available, but it should be given sparingly during the rains and winter; some pigeons, such as the Wonga Wonga, are fond of hard stones of fruits, but in captivity, where they are not required to make any exertion to procure sustenance, over-indulgence in such food induces diarrhœa; figs and berries are the most suitable kind of food for the various fruit-eating species. During the season when the fruits of the peepul (*Ficus religiosa*) and bur (*Ficus bengalensis*) ripen, no opportunity should be lost of collecting them from the neighbouring trees and giving them to the birds. Green food, such as cabbage leaves, spinage, &c., should be frequently supplied.

Transport.—For the more delicate and shy pigeons the most suitable travelling cage is that used for the transport of pheasants (p. 335), except that no padding is required for the top inside, as pigeons are not much given to jumping upward like pheasants.

Breeding.—Pigeons vary much in disposition: some are extremely shy breeders, but others, like the Indian blue-rock pigeon, will breed anywhere. When two birds show signs of pairing, it is better to place them together in a separate cage away from the rest; this operation is, however, often neglected for want of suitable accommodation. In former years the crown pigeons were sometimes noticed making attempts at the construction of a nest; they carried up hay, bits of sticks and other materials to a large box with an open top, fixed against the wall of the aviary some fifteen feet above the floor, and, from their assiduous attention to this domestic arrangement it was hoped that they would breed, but the result was disappointing. They were much worried by the other birds pulling out the materials with which they attempted to build their nests. One of the hens of the common crown pigeon twice laid on the floor, but on each occasion, the egg being placed in a nest, the pair concerned declined to take any notice of it. Of late they have given up all attempts at building, and even the isolation of a pair has failed to induce the hen to lay. The Nicobar

pigeons have twice bred in the garden ; on each occasion the hen laid a single egg in a loosely constructed nest of hay and cocoanut fibres ; during the period of incubation both the male and female sat by turns. The young birds do not get their hackles until the second year, and their general colour is a dull blackish brown with faint copper-bronze reflexions. The emerald doves have also bred ; the hen of a pair of these, living in one of the large side cages in an aviary, took to laying in the seed pan, instead of taking the trouble of building a nest, and there hatched out and reared its young.

TREATMENT IN SICKNESS.

Pigeons, like many other birds, suffer from *cold, catarrh, diarrhœa, vertigo, rheumatism, &c.* ; there is no need to add to what has already been said on these matters. They have also been known to die of other diseases of which the nature remains yet undetermined. A kind of epidemic once broke out in an aviary, and although some other birds also died, it created special havoc among the koklas and green pigeons ; sometimes half a dozen birds were found dead of a morning ; they were mostly strong and well-fed creatures, and careful autopsy failed to detect anything wrong internally. It was singular, however, that every one of them seemed to have a tiny bare patch about their necks, as if the feathers had been forcibly plucked, causing slight congestion of the skin. In an epidemic of this kind, from whatever cause arising, it is advisable to reduce the number of birds in the aviary, as overcrowding is one of the possible causes of such an outbreak, and it also serves the purpose of isolating the healthy and unaffected birds. All the old sand, gravel, earth and grass should be removed, and the house thoroughly washed, scraped and, where practicable, gently fumigated ; old drinking vessels had also better be changed and new substituted.

OBSERVATIONS ON THE HABITS OF PIGEONS.

As a rule pigeons and doves are harmless timid birds, of somewhat regular and methodical habits ; some are extremely shy and retiring, while others, though not bold and obtrusive, are nevertheless sociable. Owing to their large size, pleasing colour, and beautiful crest, crown pigeons form a very important feature of an aviary ; they may be generally seen pacing the cage up and down or round the tank, wagging their tails, and sometimes uttering at intervals a deep and a somewhat prolonged booming noise ; they have another kind of note—a hoarse and hissing grunt, which may be heard while they are fighting ; their manner of fighting is also peculiar ; they face each other, then suddenly jumping upward and forward peck at the head or face of the adversary. The flight of the crown pigeons is heavy and accompanied by a loud whirring noise like that of pheasants ; they have never been found to take a bath by immersion, but one may sometimes be noticed sitting under the jet of a playing fountain and enjoying a bath by exposing first one wing and then the other. The singular attitude which a crested pigeon assumes in order to display its plumage while pursuing a female has something ludicrous in it ; it suddenly crouches forward on its breast, raises its expanded tail, and slowly

and majestically follows the object of its pursuit. Some of the fruit pigeons feel the cold, and like nothing better than a snug warm corner; several of them may be seen on a windy winter morning sitting in a row with half their bodies inside the nests.

(128) THE INDIAN CUCKOO.

(CUCULUS MICROPTERUS—*Gould.*)

Bengali—*Bou-katha-kau.*

Well known in Bengal.

Hab.—Common in Bengal and Northern India, the Himalayas, and Central India; it extends through Assam and Burmah to the Malay countries.

LENGTH OF LIFE IN CAPTIVITY.

About nine months.

With respect to *housing* and *feeding* it may be treated like the the next species.

(129) THE COMMON HAWK CUCKOO.

(HIEROCOCCYX VARIUS—(*Vahl.*))

Hindi and Bengali—*Pâpia.*

The *pâpia* is a very well-known bird in Lower Bengal.

Hab.—Found throughout the whole of India, and according to some authorities also in Burmah and Malayana.

LENGTH OF LIFE IN CAPTIVITY.

This species has also been very short-lived in the garden, owing chiefly to the fact that generally adult specimens are received as presentations, and they seldom become reconciled to captivity.

TREATMENT IN HEALTH.

Housing.—When captured young it does well as a cage-bird; it ought never to be placed in a large aviary with other birds; in the first place, because it is extremely shy and does not like to live in the open, and in the second, the smaller birds are very apt to worry it, mistaking it for a *shikra*, which it somewhat resembles.

Food.—Satoo, fruits, insects: for young birds satoo should be made into a soft pulp.

TREATMENT IN SICKNESS.

Adult birds pine away and die; the younger birds suffer from cold and rheumatism, the result generally of careless feeding and exposure.

HABITS OF THE COMMON HAWK CUCKOO.

The common hawk cuckoo is a great favourite with the bird-fanciers of Bengal, chiefly for its sonorous musical notes. A few of these birds live in a wild state within the garden, but they are seldom seen in the open, so that unless they may be calling (and they only call during the breeding season) it is difficult to detect their presence; they are wary and suspicious, and look very like a *shikra* when darting down to secure some insect as food.

(130) THE RED-WINGED CRESTED CUCKOO.

(COCCYSTES COROMANDUS—(Linn.))

Description.—Black above with a slight gloss of green; a white band across the nape; wings deep rusty colour; under parts white; bill black; legs plumbeous; total length about $14\frac{1}{2}$ inches.

Hab.—India, Ceylon, Burmah, and Malayana; nowhere abundant, and rarely met with in Lower Bengal. A specimen was captured in the neighbourhood of the garden, but it did not survive long.

(131) THE INDIAN COEL.

(EUDYNAMIS HONORATA—(Linn.))

Hindi—*Koel*. Bengali—*Kokil*.

Hab.—India, Ceylon, Burmah, extending through the Malayan peninsula to the Philippines. A few specimens may be found living in the garden in a wild state throughout the year.

LENGTH OF LIFE IN CAPTIVITY.

The longest period during which a coel has lived in the garden has been fourteen years, *i.e.*, from 1876 to 1889.

TREATMENT IN HEALTH.

Housing.—Coels do as well in a large aviary as in a small cage; they are frequently caged in Bengal for their melodious notes.

Food.—Satoo, fruits and insects; they are particularly fond of the fruits of the *banian*, *pipul* and *bakul* (*Mimusops elengi*), and also *telakucha* (*Momordica monadelphica*), a kind of common creeper which grows wild during the rains. They sometimes overfeed themselves, and then disgorge the seeds of the fruits they have eaten.

Breeding.—Coels do not breed in captivity; but in a wild state they breed almost every season within the garden or in its immediate neighbourhood. It is well known that the females deposit their eggs in the nest of common crows.

Nothing is known about their maladies.

OBSERVATIONS ON THE HABITS OF A COEL.

It is shy and unobtrusive, but nevertheless more sociable than the common hawk cuckoo; it is arboreal in habits, never being seen on the ground except for a moment when it descends to carry away its food. It calls beautifully even in captivity, and during the breeding season it may be heard to call at night also, especially if there is a moon.

(132) THE INDIAN COUCAL.

(CENTROCOCCYX RUFIPENNIS—(Ill.))

Hindi—*Mahoka*. Bengali—*Kuka*, from the noise it makes.

Description.—Head, neck, lower part of the back, upper tail-coverts, and all the underparts purplish black; upper part of the back and wings deep rufous; tail green-glossed; bill black; iris crimson; legs black; total length about 19 inches. They vary somewhat according to age, sex and even locality.

Hab.—Found all over India, Burmah, and Malayana.

LENGTH OF LIFE IN CAPTIVITY.

About seven years.

TREATMENT IN HEALTH.

Housing.—May be kept with a magpie and crow, but certainly not with smaller birds.

Food.—Satoo prepared with minced meat, eggs, small lizards, frogs, land snails, and even small birds.

OBSERVATIONS ON ITS HABITS.

It spends much of its time on the ground searching for insects and spiders. The specimen that lived in the garden often killed rats and mice. It has a deep monotonous and somewhat doleful note, which it utters repeatedly for several minutes.

(133) THE LESSER INDIAN COUCAL.

(CENTROPUS VIRIDIS—(Scop.))

Description.—Head, nape, upper tail-coverts, breast and abdomen greenish-black; wings and back rufous; tail greenish-black; total length about 15 inches. This species also varies much according to sex and age.

Hab.—Found throughout the greater part of India; more common in some places than in others.

LENGTH OF LIFE IN CAPTIVITY.

A specimen lived for about six months only. As it is a well-known bird, no great trouble has ever been taken to exhibit it.

(134) THE LITTLE INDIAN KINGFISHER.

(ALCEDO BENGALENSIS—*Gmel.*)

Bengali—*Chota Māchch-rāngá.*

Hab.—India, Ceylon, Burmah, Malayana, &c. It has an extensive distribution, being found in Eastern Africa, Siberia, Japan and the islands of the Malay Archipelago; often found in a wild state within the garden.

(135) THE INDIAN STORK-BILLED KINGFISHER.

(PELARGOPSIS GURIAL—(*Pears.*))

Bengali—*Gurial.*

Hab.—Found almost all over India, Ceylon, and even Malayana; common in Bengal.

(136) THE WHITE-BREASTED KINGFISHER.

(HALCYON SMYRNENSIS—(*Linn.*))

Hindi—*Kilkila.* Bengali—*Machch-rāngá.*

Hab.—Common throughout the greater part of India, up to the base of the Himalayas, Ceylon, Burmah, and through the Indo-Burmese countries to China.

(137) THE LAUGHING KINGFISHER.

(DACELO GIGANTEA—(*Lath.*))

Hab.—Australia.

LENGTH OF LIFE IN CAPTIVITY.

A specimen of the Indian stork-billed kingfisher has been living for the last three years. A laughing kingfisher lived for about seven months.

TREATMENT IN HEALTH.

Housing.—The best possible way of keeping kingfishers is to give them accommodation similar to that assigned for ducks and other smaller aquatic birds (p. 306). The next best is to keep them with the

aquatic birds themselves, but the disadvantage is that, unless sufficiently tame, they live in perpetual fear of their aquatic companions and neglect feeding. When taken young, which is the only chance of taking most birds, and fed in the same place with the ducks, but in a separate cage, kingfishers soon become accustomed to their presence. A stork-billed kingfisher has been living in a large aviary during the last year, but it was already tame when placed here.

Food.—Small fish, prawns, reptiles, frogs, &c. In captivity they will eat minced meat, but it is better not to give it every day. Small live fish may be placed in a *gamla* (earthen jar) full of water.

Breeding.—Kingfishers breed in a wild state within the garden. A pair of the white-breasted kingfishers have been found during the last four or five years to build regularly in the rhinoceros' enclosure in a steep bank of the tank, some two feet above the surface of the water.

OBSERVATIONS ON THE HABITS OF KINGFISHERS.

In captivity they are uninteresting birds, sitting motionless on a perch, and watching, not their prey, but the busy gambols of the other inmates of the house. The only time that one is observed to become lively is when the food is forthcoming; the stork-billed kingfisher now living in the garden may be observed to open its mandibles while looking on other birds feeding.

(138) THE INDIAN ROLLER.

(CORACIAS INDICA—(Linn.))

Hindi and Bengali—*Nilkanta*.

A well-known bird in Lower Bengal.

Hab.—Found all over India up to the base of the Himalayas, and also in Ceylon.

LENGTH OF LIFE IN CAPTIVITY.

Specimens have been living since December 1887. This, however, does not represent their period of captivity, as they were living in the menagerie of the late King of Oudh before their inclusion in this collection.

TREATMENT IN HEALTH.

Housing.—Appears to do well in a large aviary; adult birds do not thrive at all, and as they are commonly brought in should be rejected.

Food.—Sattoo, minced meat, insects and worms; it kills centipedes and small lizards whenever an opportunity presents itself.

Nothing is known with regard to its breeding or ailments in captivity.

OBSERVATIONS ON ITS HABITS.

Once reconciled to captivity, it shows neither timidity nor shyness, and keeps to the open parts of the aviary; except for a moment or two, when it descends to carry away its food it is never on the ground; while sitting on a high perch, it occasionally takes short flights in the air and again perches on the same spot; this is probably instinctive; one may sometimes be seen sunning itself after a bath spreading its wings; it has a harsh grating call, but is not a noisy bird.

(139) THE BURMESE ROLLER.

(CORACIAS AFFINIS—*McClell.*)

Hab.—Except in the extreme south of Tenasserim, it is found throughout Burmah; it is also found in Siam and Cochin-China, and extends through the Indo-Burmese countries to Assam and as far west as Calcutta.

A specimen lived for about a month only.

(140) THE RHINOCEROS HORNBILL.

(BUCEROS RHINOCEROS—*Linn.*)

Description.—Head, neck, back, wings, breast, uniform bluish-black; thighs, lower part of the abdomen, upper and under tail-coverts, rump, pure white; tail pure white with black band across its lower third (the width of the black band varies much in different specimens); the most conspicuous point of this species is its large upturned casque, which is generally red, but slightly yellowish anteriorly; the bill is of a light-yellow colour, having a triangular space of red at the base of the maxilla, and of black on the mandible; iris yellowish; eyelid red; total length about 36 inches. Sexes slightly differ; the back part of the casque in the female is reddish instead of black, and the eyelids are white.

Hab.—Malayan peninsula, Sumatra, Borneo.

LENGTH OF LIFE IN CAPTIVITY.

About four years.

(141) THE JAVAN RHINOCEROS HORNBILL.

(BUCEROS SILVESTRIS—*Vieill.*)

Description.—In general appearance it resembles the preceding species, but differs from it in having a casque which is straight and not upturned; the base of both the maxilla and the mandible black, edged with red; the colour of the bill pale yellow, but it varies somewhat in different specimens.

Hab.—Java.

LENGTH OF LIFE IN CAPTIVITY.

A specimen has been living for the last five years.

(142) THE GREAT PIED HORNBILL, OR THE HOMRAI.

(DICHOCEROS BICORNIS—(Linn.))

Description.—Head, at the base of the casque and the bill, black; occiput, neck, thighs, upper and under tail-coverts white; wings black; the tips of the greater coverts, primaries and secondaries, white; a patch at the middle of the primaries white; tail white with a black band across; bill curved and pointed and of a light yellow colour; the base of both maxilla and mandible black; casque broad and flat, forming a notch at its junction with the bill, and extending posteriorly over the head for about half an inch; the greater part of the casque is of the same colour as the bill; its posterior termination is black, edged with red; anteriorly it is also black, which reaching to the bill continues along the culmen to the point; the total length of an adult specimen is over 3 feet.

Hab.—In India it inhabits the lower ranges of the Himalayas, southern slopes of the Nilgiris, and the forests of the Malabar Coast; it is also found in Assam, Burmah, the Malayan peninsula and Sumatra. With very few exceptions the specimens hitherto exhibited in the garden came either from the Malayan peninsula or Sumatra.

LENGTH OF LIFE IN CAPTIVITY.

No specimen has yet lived for more than five years and a few months.

(143) TEMMINCK'S PIED HORNBILL.

(ANTHRACOCEROS CONVEXUS—(Temm.))

Description.—The whole under part, including the thighs, white; the ends of the primaries and secondaries, and all the lateral tail feathers also white; the rest of the plumage black, with faint purplish reflexions; a narrow circle round the eyes white; an irregular square patch of white at the cheeks; bill curved and yellowish white; the casque is also of the same colour, except its two ends, which are black, there being more black anteriorly than in its posterior terminus; it ends rather abruptly on the bill at about two-thirds of its length; total length about 28 inches; iris red; feet plumbeous.

Hab.—Malacca, Java, Sumatra, Borneo. Specimens undoubtedly referable to this species, and exhibited here, were said to have been obtained from the Himalayas. This, however, requires confirmation.

LENGTH OF LIFE IN CAPTIVITY.

Some have been living for over two years.

(144) THE SMALL PIED HORNBILL.

(ANTHRACOCEROS ALBIROSTRIS—(*Shaw.*))

Description.—Head, neck, the whole upper part, including the wings and tail, with the exception of the tips of the latter, black with a bluish gloss; the under parts, with the tips of the secondaries and primaries, and the ends of the tail, white; bill curved, and of a yellowish white colour, with a black patch at the base of the mandible; casque, which is narrow and sharp in front, and rounded and blunt behind, is of the same colour as the bill; broad irregular patch of black at its anterior end extending on to the bill; a bare reddish patch just behind the base of the mandible; also a very narrow patch of the same colour behind the eyes; total length about 30 inches; legs leaden blue.

In the female the casque does not extend so far forward on the maxilla as in the male, and also gently slants down instead of ending in a sharp angle.

Hab.—India, Burmah, the Malayan peninsula and Borneo. In India it has been recorded from Midnapore, Rajmahal, Monghyr, Nepal, Assam, Sylhet and Tipperah.

LENGTH OF LIFE IN CAPTIVITY.

About six years.

(145) THE WHITE-BILLED HORNBILL.

(ANTHRACOCEROS MALAYANUS—(*Raffles.*))

Description.—It is a jet black bird, with the exception of the tips of the lateral tail feathers, which are white; bare space round the eye blue; colour of the bill and casque bluish black; the base of the casque projects backward over the forehead, while its anterior portion forming an acute angle with maxilla slants upwards and forwards to a point; total length about 30 inches; legs leaden blue.

Hab.—Malayan peninsula, Sumatra, and Borneo.

LENGTH OF LIFE IN CAPTIVITY.

Nearly three years.

(146) THE GREY HORNBILL.

(OCYCEROS BIROSTRIS—(*Shaw.*))

Bengali—*Dhane*s.

Description.—The prevailing colour of the plumage grey, deeper about the head and lighter about the abdomen and back; primaries and secondaries brownish-black tipped with white; tail tipped white, and

above that a black bar; bill much curved, its anterior part yellowish-white, rest greyish-black; casque is low and compressed, anteriorly it forms an acute angle with the culmen, then slants forward and upward to a very sharp point; total length about 20 inches, iris red-brown; feet plumbeous.

Hab.—Found in the drier parts of India, but does not extend east of Western Bengal. Specimens are now and then brought to the Calcutta market from Midnapore, Hazaribagh, and Monghyr.

LENGTH OF LIFE IN CAPTIVITY.

No record has been kept of the actual period during which any of them lived in the garden.

(147) THE RUFOUS-NECKED HORNBILL.

(*ACEROS NEPALENSIS*—(*Hodgs.*))

Description.—Head, which is slightly crested behind, neck, and lower parts generally, black with a green gloss; most of the primaries broadly tipped with white; the terminal half of the tail white, the rest black; bill yellow; no casque; the base of the culmen slightly raised; the sides of the upper bill ridged at the base; the grooves of the ridges chestnut brown; the naked skin around the eye and at the base of the bill, light blue; the naked sac of the neck, red, lined with blue; total length about 3 feet. The sexes differ; the female being entirely dingy-black glossed with green; the tips of the primaries and the ends of the tail feathers of the same colour as in the male. A pair of young birds were recently on exhibition in the garden; neither of them had any blue lining to the red sac of the neck.

Hab.—South-East Himalayas; the hill ranges of Assam and Manipur; Tenasserim.

LENGTH OF LIFE IN CAPTIVITY.

Slightly over six years.

(148) THE WREATHED HORNBILL.

(*RHYTIDOCEROS UNDULATUS*—(*Shaw.*))

Description.—Top of head, crown, and occiput dark brown; sides of the head yellowish white (colour varies somewhat in different specimens); lower neck and breast white; the rest of the plumage black, with greenish reflexions; tail white; bill buffy-white; the base of the culmen roughened with the presence of several transverse scaly grooves, base of maxilla and mandible grooved, and of a brown colour in the former, and reddish-brown in the latter; bare skin around the eye pinkish, that of the throat, forming a miniature sac, yellow, with a conspicuous lining of dark blue on its lower part; total length about 28 inches; in the female the naked skin of the throat blue.

Hab.—Found in the hill ranges of Sylhet, Cachar, and extends through the Malayan peninsula to Sumatra and Java.

LENGTH OF LIFE IN CAPTIVITY.

About six years.

(149) THE WRINKLED-BILL HORNBILL.

(CRANORRHINUS CORRUGATUS—(Temm.))

Description.—Sides of the head, neck, and upper breast white; the rest of the plumage black; the terminal portion of the tail deep rufous; bill yellow with a blunt pyramidal red casque; base of the neck red, with irregular blue markings; the bare skin around the eye blue; the female has no red casque, but the culmen is somewhat raised at its basal half; throat blue.

Hab.—Malacca, Sumatra, and Borneo.

LENGTH OF LIFE IN CAPTIVITY.

A specimen lived for about a month and a half only.

TREATMENT IN HEALTH.

Housing.—However advantageous it may be in many ways, the hornbills cannot, unfortunately, be kept in a large aviary where numbers of other birds of different sizes live. They are not only tyrannical, but to a certain extent predatory in habits, so that small birds cannot but fare badly with them; neither is it altogether safe to keep a number of them, of the same or different species, together, as they are given to fighting among themselves; but if a keeper is intelligent and watchful, and all the birds are healthy, there is no very great difficulty in managing them; the slightest aggressive tendency on the part of any may be immediately checked, or a weak or timid specimen removed. Young, and even newly-acquired old birds, remain very helpless for some time, and they should on no account be placed, on arrival, with the older specimens. For these young or otherwise helpless birds, which are incapable of flight, blocks of wood or stone or low perches or ladders should be provided, and a thick bedding of hay spread over the floor of the cage. A lofty and spacious cage where they can sail about merrily, and one which is neither very cold during the winter nor very warm during the summer, is the most desirable accommodation for hornbills; branches of tamarind or sissoo, or in their absence stout *garan* poles, make capital perches for them; one or two hollow logs of wood, which they may at least make use of as retiring nests should, if possible, be provided. During the summer hornbills have been found to appreciate a shower bath administered by a garden syringe.

Food.—In captivity they thrive on a mixed diet consisting of boiled rice, minced meat and fruits; small birds and insects are

occasionally given as a change to sharpen their appetite. Their manner of taking food is characteristic, and unless therefore the boiled rice is made into pellets or balls they cannot take it; the minced meat may also be mixed up with the boiled rice when making the pellets; all sorts of berries and figs whenever available should be given them, but when these are not to be had, plantains cut up into bits should be substituted. Hornbills are voracious feeders, and are therefore expensive birds to keep. Young birds should be fed several times a day, and it may be necessary to feed them by hand.

Breeding.—Hornbills have never bred in captivity here. It may not be uninteresting to mention in this connection the singular habit of the male “of enclosing the female in the hollow of some tree, firmly fastening her in by a wall of mud, and keeping her a closed prisoner until the eggs are hatched.”

Transport.—A hornbill is easy to transport, as it is not an excitable creature. Its travelling cage ought to be somewhat higher than the size of the bird may require, as it is accustomed to jerk up its bill when feeding.

TREATMENT IN SICKNESS.

Severe cold, inflammation of the lungs, rheumatism, intestinal worms, *diarrhœa* and other undetermined forms of diseases have been met with amongst these birds. Young birds have sometimes suffered from *rheumatism* during the winter, but recovered with the setting in of the warm weather; *cold* and *diarrhœa* have often been found to follow each other, and as often yield to careful dieting and nursing; the first requisite, of course, being the removal of the patient to a snug handy cage, where it can be handled without causing much annoyance to it. One drachm of rum and ten drops of syrup of lactate of iron are generally effective when there is *diarrhœa* and *cold*. If there be any difficulty of breathing, five to eight grains of chlorate of potash in water may be given with good result.

OBSERVATIONS ON THE HABITS OF HORNBILLS.

Although generally shy in their wild state, hornbills become very tame in captivity, so that it is not unusual to observe them coming to the side of the cage ready to respond to friendly greetings. This trait of character is especially noticeable in certain species, such as the small pied hornbill. Rhinoceros hornbills have also been known to get wonderfully tame within a few days after their arrival. The flight of the hornbill, especially of the larger species, is laboured and heavy, and accompanied by much whirring noise. They have a curious habit of hopping about sideways, not only on the perch which may be necessary, but on the ground also. Young hornbills have a plaintive cackling note which they keep on uttering almost continually, but more especially when hungry; the adult pied hornbill has a somewhat pleasing metallic sound which it quickly and repeatedly utters several times; the homrai, though usually a silent bird, sometimes makes a loud and very deep noise which may be heard from a very long distance. For further information Elliot's Monograph of the *Bucconidae*, or family of the Hornbill, may be consulted.

(150) THE ARIEL TOUCAN.

(RAMPHASTOS ARIEL—*Vig.*)

Description.—Bill, which resembles that of a hornbill without a casque, black; throat and breast orange yellow, bounded below by a bright yellow band; below that is a patch of scarlet.

Hab.—Brazil.

LENGTH OF LIFE IN CAPTIVITY.

About thirteen months.

(151) THE SULPHUR-BREASTED TOUCAN.

(RAMPHASTOS CARINATUS—*Swainson.*)

Throat and breast delicate yellow; abdomen scarlet.

Hab.—Mexico.

LENGTH OF LIFE IN CAPTIVITY.

About the same as the last.

TREATMENT IN HEALTH.

Housing.—Toucans are impatient of cold and draughts, and greater success in keeping them alive might be obtained by having a house from which cold and draughts could be perfectly excluded at night during the winter.

Food.—Fruits, crumbs of bread, minced meat, and eggs.

OBSERVATIONS ON THEIR HABITS.

Very active; both these species have a metallic ringing note. They are thoroughly arboreal.

(152) THE ROSE-CRESTED COCKATOO.

(CACATUA MOLUCCENSIS—(*Gmel.*))

Though not a native of this country, the bird is so well known in Bengal that no description is necessary.

Hab.—The Moluccas.

LENGTH OF LIFE IN CAPTIVITY.

Specimens have been living in the garden since 1877.

(153) THE GREATER SULPHUR-CRESTED COCKATOO.

(CACATUA GALERITA—(*Lath.*))

Also well known in Bengal.

Hab.—Australia.

LENGTH OF LIFE IN CAPTIVITY.

Specimens have been living since 1877.

(154) THE LESSER SULPHUR-CRESTED COCKATOO.

(CACATUA SULPHUREA—(*Gmel.*))

Description.—Smaller than an ordinary sulphur-crested cockatoo; the prevailing colour of the plumage white, with light yellow shade on the wings and tail; a yellow spot beneath each eye; the crest, which is pointed and directed forward, is light yellow; bill and legs black.

Hab.—The Moluccas and Celebes.

LENGTH OF LIFE IN CAPTIVITY.

This species has, unfortunately, been short-lived in this garden, none of them having survived more than six years.

(155) THE GREATER WHITE-CRESTED COCKATOO.

(CACATUA CRISTATA—(*Wagler.*))

Description.—Of the same size as the rose-crested cockatoo, with the exception of the primaries and the lateral tail feathers, which are shaded light yellow, the bird is entirely snow white; bill plumbeous black, legs lead colour, irides black or sometimes brown; the crest, though long, is not visible except when the bird is excited. In some specimens the crest is light orange red colour, and there is no yellow shade in the primaries and tail feathers.

Hab.—The Moluccas and Ceram.

LENGTH OF LIFE IN CAPTIVITY.

Specimens have been living since 1880.

(156) THE BLOOD-STAINED COCKATOO.

(CACATUA SANGUINEA—*Gould.*)

Description.—General colour white; lores and front reddish; the crest is pyramidal in shape; the circular naked space around the eye flesh coloured or white; the crest feathers rosy at the base.

Hab.—North Australia.

LENGTH OF LIFE IN CAPTIVITY.

Did not survive more than a year and six months.

(157) THE ROSEATE COCKATOO.

(CACATUA ROSEICAPILLA—*Vieill.*)

Description.—Forehead, crown, and occiput white, tinged with pink; nape, sides of the head, breast and the rest of the underparts rosy red; back and wings delicate ashy grey; ends of the primaries ashy black; under surface of the tail feathers also ashy black.

Hab.—Found throughout the greater part of Australia.

LENGTH OF LIFE IN CAPTIVITY.

Specimens have been living for the past twelve years.

(158) THE CITRON-CRESTED COCKATOO.

(CACATUA CITRINO-CHISTATA—*Fraser.*)

Description.—Smaller in size than the sulphur-crested cockatoo; general colour snow white; crest pointed and of a citron yellow colour.

Hab.—Timor Laut.

LENGTH OF LIFE IN CAPTIVITY.

Over six years.

(159) LEADBEATER'S COCKATOO.

(CACATUA LEADBEATERI—(*Vig.*))

Description.—General colour white; nape, sides of the neck, neck and breast rosy red, deeper about the breast; a red band across the front at the base of the bill; under surface of the wings also rosy red; the crest is very conspicuous, being formed of double rows of plumes joined in front at an obtuse angle; the plumes are red at the base, above that pinkish yellow, then red again, and the tips white; bill horny white; legs flesh colour.

Hab.—Australia.

LENGTH OF LIFE IN CAPTIVITY.

Specimens have been living in the garden since 1882.

(160) THE BARE-EYED COCKATOO.

(CACATUA GYMNOPIS—*Sclater.*)

The distinctive characteristic of this species is the bare area round the eye; this bare space is much dilated underneath, and of a plumbeous blue colour; crest pyramidal; lores and front rosy red.

Hab.—Australia.

LENGTH OF LIFE IN CAPTIVITY.

A specimen has been living since 1877.

(161) THE LONG-BILLED COCKATOO.

(LICMETIS TENUIROSTRIS—*Wagler.*)

Description.—General colour white; forehead and face reddish; throat and upper breast pinkish red (in younger specimens only patches); bare skin round the eyes faint blue-black; the upper beak elongated. In some specimens there is more red than in others. It has no crest, but the feathers of the head are erectile.

Hab.—Found in South and South-West Australia, and also more or less in some other parts.

LENGTH OF LIFE IN CAPTIVITY.

Specimens have been living for the last fourteen years.

(162) THE GREAT BLACK COCKATOO.

(MICROGLOSSA ATERRIMA—(*Gmel.*))

Description.—Size large, general colour black, glossed with a light greenish-grey tinge; a large bare pinkish patch on the cheek below the eye; the crest is composed of numerous slender feathers directed backward.

Hab.—New Guinea; also found in the adjacent islands of Eastern Australia.

LENGTH OF LIFE IN CAPTIVITY.

A specimen lived for a year only.

TREATMENT IN HEALTH.

Housing.—With the exception, perhaps, of the last-named species, all the cockatoos described above are more or less hardy birds, and therefore easy to accommodate; it is only necessary to be careful about draughts and sudden change of temperature. The method of keeping cockatoos chained up to a perch is somewhat antiquated, but it is decidedly preferable, being less cruel, to imprisoning them in very small cages, where they have hardly room to turn; spacious iron cages made of $\frac{1}{8}$ inch rods and about three feet square, are admirably adapted for exhibiting them in a zoological garden; the perches for the cage should be made of the hardest possible wood; a bedding of hay should be provided, and small logs of old timber or cocoanut shells given to amuse the birds; even where an opportunity existed, cockatoos have not been observed to indulge in a bath, but most of

them appreciate and enjoy a shower from a garden syringe or a watering can; in fact this is a necessity for them during the sultry hot days in summer.

Food.—Paddy, Indian-corn, gram, barley, hemp-seed, chillies, and vegetables form their principal food in captivity; but besides these a variety of other things may be given them: the long-billed cockatoo is extremely fond of sweet potatoes, and enjoys nothing better than digging up roots and bulbs with its long and pointed bill. Most of them are very fond of sugarcane; the great black cockatoo manages, with surprising ease, to extract the kernel of the hardest nuts which a hammer will break with difficulty; in captivity all of them evince great partiality for biscuits, which may be given them as a change; soft food, such as bread and milk or milk and rice, should be avoided as much as possible. Although some of the cockatoos feed a great deal upon caterpillars and insects in their wild state, they do better without them in captivity; in fact, except under special circumstances, no stimulating food should be supplied.

Breeding.—The great white-crested, the long-billed, and the sulphur-crested cockatoos have sometimes laid in the garden, but none of them could be induced to sit, although in every instance the cage containing the birds was removed to a quiet spot. As far as they have been observed, cockatoos are not unlikely to breed in this climate if suitably lodged; a spacious cage or a small aviary in some retired part of the garden, as much embowered and sheltered by creepers and shrubs as possible, is all that is necessary; each pair of birds intended for breeding should, of course, be kept separate, and some hollow logs of wood provided as nesting accommodation. When the birds show symptoms of pairing, some stimulating food may be supplied, such as insects, caterpillars, or even finely minced mutton.

Transport.—The travelling cage for cockatoos ought to be lined inside with zinc or sheet iron, and the front made of $\frac{1}{8}$ " or, still better, $\frac{1}{4}$ " iron bars, as otherwise they will soon cut through the wire or the plank; as many of them can be sent in a cage as the perch will accommodate; they are not much given to fighting when a number of the same species are being carried in this fashion; an exception must of course be made with respect to the rose-crested and great black cockatoos.

TREATMENT IN SICKNESS.

Fortunately cockatoos have generally maintained excellent health in this garden, and comparatively few cases of sickness have been observed. *Diarrhoea* has sometimes been noticed in cockatoos, probably induced by careless feeding or brought on by exposure to cold; in such cases birds recover when the cause is removed. *Running from the nose* caused by cold is not unfrequent in cockatoos during the winter; this shows that the housing is faulty and that they require more warmth; but if the bird is really bad from cold and shows a disinclination for food and drink, chlorate of potash, liquorice and honey should be prescribed. During the hot weather cockatoos have been known to drop down suddenly dead from *apoplexy*; as the subjects suffered from fat, over-feeding was probably the cause of these deaths.

OBSERVATIONS ON THE HABITS OF COCKATOOS.

As the rose-crested and the sulphur-crested cockatoos are constantly caged in Lower Bengal, their habits are well known; the former becomes wonderfully tame in an incredibly short time, and, but for its proneness to mischief, can be kept loose in a garden without any risk of its escaping. The experiment was tried some twelve years ago, and was so far a success that the cockatoo always came back to its sleeping cage at night, and, though it occasionally played truant, it never showed any inclination to stray, but greatly enjoyed its freedom and amused itself in various ways. A cockatoo has been known to attend the meetings of the Committee of Management of the gardens, perching with becoming gravity on the back of one of the vacant chairs, and joining in any bursts of laughter; sometimes it would spend the day in an adjoining house, and destroy picture frames and tear window curtains, although it was well treated. The same bird on its expeditions visited the neighbouring Observatory and broke some scientific instruments, so that it became requisite to confine him to his cage. Cockatoos are, as a rule, somewhat demonstrative and have various ways of expressing their pleasure: most of them come to the side of the cage to be stroked and spoken to, and have most winning manners, but their temper cannot be always and absolutely trusted. Although not altogether untameable, the Leadbeater's cockatoo wants those qualities for which a pet is valued; it is somewhat shy and suspicious, and takes a very long time to become reconciled to captivity; teasing makes it wild and spoils its temper for ever. Some of the cockatoos have a curious habit of hiding under the thick hay bedding of the cage, and from there calling out softly as if to create a surprise; the rose-crested cockatoo, in spite of its many virtues, has one great drawback—it screams loudly and sometimes incessantly; the bare-eyed and the great black cockatoos are the least noisy birds.

For further information about cockatoos, Gould's *Birds of Australia*, volume V, and *Parrots in Captivity* by W. T. Greene, may be consulted.

(163) THE CRESTED GROUND PARRAKEET.

(*CALOPSITTA NOVÆ-HOLLANDÆ*—(*Gmel.*))

Description.—General colour of the plumage delicate ashy grey, somewhat paler about the breast and abdomen; the crest and the face light yellow; a brownish red patch in the cheek; the crest, which is pyramidal in shape, varies in thickness and length in different individuals, and the bird has no power to elevate or depress it at will; the extent and the intensity of the yellow about the face vary somewhat in different specimens and also according to age, and even, as far as has been noticed here, according to the season of the year; the sexes differ, the female has scarcely any yellow about the face, and the under surface of its tail is barred and mottled instead of being black like the male: total length about 11 inches.

Hab.—Australia.

LENGTH OF LIFE IN CAPTIVITY.

A specimen is living since 1880, another since 1882, and others for over two years.

TREATMENT IN HEALTH.

Housing.—It does equally well singly or in pairs, in small cages or in large aviaries; with respect to cold and draughts, the same care should be bestowed upon it as upon a cockatoo or any other delicate bird; though fond of nibbling at things, the cutting power of its beak is limited, so that its cage need not be as strong as that of a cockatoo.

Food.—Smaller grains and seeds constitute their principal food; in this garden they are chiefly fed upon canary seeds and paddy, with a constant and liberal supply of vegetables.

Breeding.—They have occasionally laid eggs, but never succeeded in hatching out young, having unfortunately given up sitting after a day or two. A box one foot long, 9 inches in breadth and height, with a saucer-shaped wicker basket fixed inside, makes excellent nesting accommodation for a pair of these birds.

Nothing is known about their ailments in captivity.

OBSERVATIONS ON THEIR HABITS.

When half a dozen of them are living with other birds in a large aviary, they flock together, but they are by no means exclusive, as now and then one may be observed to associate and even make friends with a different species; the motions of these birds are graceful as they either fly or walk on the ground; those living in a large aviary seldom learn to talk: cage birds, however, soon pick up words and sentences.

(164) ALEXANDRINE, OR THE ROSE-BAND
PARRAKEET.

(PALÆORNIS EUPATRIUS—(Linn.))

Hindi—*Rai-Suga*. Bengali—*Chandana*.

This and the following parrakeets (Nos. 165, 166, 169 and 170) are well known in Lower Bengal, and therefore no description is given. It varies somewhat in size and colour.

Hab—This species is found in Northern India, including the lower ranges of the Himalayas, the forests of Malabar, Central and Southern India, Eastern Sunderbuns, and extends through Assam and Cachar to British Burmah; it is also found in Ceylon and Eastern China: those found in Ceylon are smaller and lighter-coloured birds than those from Northern India.

LENGTH OF LIFE IN CAPTIVITY.

A specimen from Northern India has been living in the garden for upwards of ten years.

A larger variety of this bird has now and then been obtained from the Andaman Islands, but as it does not differ from the present species, except in size, it has been included under it.

(165) THE ROSE-RINGED PARRAKEET.

(PALÆORNIS TORQUATUS—(Bodd.))

Hindi—*Tiya*, *Gollar*. Bengali—*Tota*, *Tiya*.

A perfectly yellow variety of this bird with a faint mark of the ring is sometimes met with, and those with yellow predominating are not uncommon; in the African forms the breast is delicate ashy, and the head lavender-blue: the sexes differ in colour.

Hab.—Found throughout India from the foot of the Himalayas to the extreme south; not so abundant in Eastern Bengal as in other parts; it is also found in British Burmah and Ceylon, and extends as far east as Cochin-China. Some may always be found living in a wild state within the garden. During the season when the sun-flower seeds ripen, small migratory flocks are constantly seen foraging on them.

LENGTH OF LIFE IN CAPTIVITY.

Although specimens of this extremely common parrot are always living in the garden, no record has been kept.

(166) THE ROSE-HEADED PARRAKEET.

(PALÆORNIS CYANOCEPHALUS—(Linn.))

Hindi—*Tuia-tota*. Bengali—*Fariadi* or *Faredi*.

In captivity some have been noticed never to assume the cherry-red cap so characteristic of an adult male.

Hab.—Found almost all over India, extending through Assam to Burmah and Ceylon; in Lower Bengal it is chiefly confined to its western limits.

LENGTH OF LIFE IN CAPTIVITY.

Unfortunately no record has been kept; they appear to bear captivity less kindly than other Indian parrakeets.

(167) THE SLATY-HEADED PARRAKEET.

(PALÆORNIS SCHISTICEPS—Hodgs.)

Hindi and Bengali—*Madna*.

Description.—Head slaty-blue, much paler in some; general colour green; a narrow band of black separating the slaty-blue of the head and the green of the rest of the plumage; a reddish wing spot present in the male; in the female the spot is faint and indistinct.

Hab.—Lower ranges of the North-West Himalayas; the hill ranges of Assam and Sylhet; not uncommon in Eastern Bengal.

LENGTH OF LIFE IN CAPTIVITY.

About five years.

(168) THE BLUE-WINGED PARRAKEET.

(PALÆORNIS COLUMBOIDES—*Fig.*)

Description.—Head, nape, upper back, chest and abdomen pale ashy grey; a green patch on the forehead, lores and below the eyes; a green collar encircles the neck, widening on its upper part; the rest of the plumage green, of different shades and intensity; bill red above, dusky beneath; legs lead colour; the female differs from the male in wanting the collar, or has only a faint trace of it.

Hab.—Found only in the Malabar coast and on the slopes of the Nilgiris up to about 6,000 feet: the specimens exhibited in the garden were obtained from the jungles of Travancore.

LENGTH OF LIFE IN CAPTIVITY.

A pair having lived for about two years were killed by some civets at night.

(169) THE RED-BREASTED PARRAKEET.

(PALÆORNIS FASCIATUS—(*P. L. S. Müller.*))

Hindi and Bengali—*Kājla*.

The *Kājla* is very commonly domesticated in Bengal.

Hab.—Sub-Himalayan regions, Assam, Sylhet, British Burmah; and extends through the Malayan peninsula to Java. Javan specimens appear to differ in no respect from the Indian birds.

LENGTH OF LIFE IN CAPTIVITY.

No record is available, but it bears captivity extremely well.

(170) THE MALAYAN PARRAKEET.

(PALÆORNIS LONGICAUDA—(*Bodd.*))

It resembles the red-breasted parrakeet in general appearance, but differs from it in having the head a beautiful rosy-red

Hab.—The Malayan peninsula.

LENGTH OF LIFE IN CAPTIVITY.

No record.

(171) THE RED-CHEEKED PARRAKEET.

(PALÆORNIS ERYTHROGENYS—(*Blyth.*))

Description.—Total length of an adult male is about 18 inches (larger specimens have also been recorded); the maxilla red, tip yellow; the mandible horny grey or blackish; the characteristic feature of the species is the red cheek; general plumage green.

Hab.—The Andaman Islands.

LENGTH OF LIFE IN CAPTIVITY.

About three years.

TREATMENT IN HEALTH.

Housing.—Most of the birds mentioned above are commonly domesticated in Bengal, and are either kept in circular dome-shaped iron cages, or chained to a perch: in a zoological garden, however, a spacious aviary is by far the best accommodation for them, particularly for the rose-headed and the blue-winged parrakeets; some of them have tremendous cutting power in their beaks, and there are birds that appear to take delight in destroying everything that comes in their way; such destructive birds should be turned out of an aviary unless the wire netting is strong enough to resist the ceaseless assault of their powerful beaks: they are all fond of a bath, and when living in a large aviary they have no difficulty in gratifying this love of cleanliness, but when kept in a cage or chained up to a perch, a cold water douche would be very agreeable to them, especially during the hot weather.

Food.—Like the cockatoos, they also thrive on grain, seeds, and vegetables; in this garden they are ordinarily fed upon gram, soaked or raw; paddy, Indian-corn, chillies, and vegetables; by way of change, fruits, biscuits, boiled potatoes are also given them occasionally; the rose-headed and red-cheeked parrakeets are particularly fond of fruits, and most of them enjoy a feast of ripe papya (*Carica papaya*): all must have ready access to clean drinking-water.

Breeding.—The ring-necked parrakeets have laid several times, but have not yet succeeded in hatching out a brood; this is, however, no fault of theirs; their surroundings are most unsuitable for such a domestic success; they often breed in a wild state in the garden; they are seldom found to bore holes in trees, but prefer a water-spout of a high terraced building to build their nest in. There is no doubt that, if the treatment recommended for the breeding of cockatoos be adopted in the case of these parrakeets also, some, if not most, of them will breed freely.

Transport.—A cage similar to that recommended for the conveyance of cockatoos, but proportionately smaller, and with lighter rods in front, will do for these; the rose-headed, slaty-headed, and the blue-winged parrakeets are not much given to cutting, and their cage need not therefore be lined with zinc inside; when, during the transport, cold latitudes are reached, the cage should be well wrapped in blanket

and, if possible, kept near the engine-room of a steamer; sudden cold is fatal to most of them.

TREATMENT IN SICKNESS.

These parakeets, with few exceptions, are hardy birds, and, if once established in captivity, maintain excellent health for years: *cold* and *inflammation of the lungs* are the common complaints from which some of them have been known to suffer; the former generally yields to dietetic and hygienic treatment, but the latter invariably terminates in death: the percentage of loss is comparatively large amongst the newly acquired rose-headed parakeets.

OBSERVATIONS ON THEIR HABITS.

The Alexandrine, the ring-necked and the red-breasted parakeets are remarkable for their intelligence and acquisitive faculties; the slaty-headed and the blue-winged parakeets do not appear to be endowed with the same mental faculties as those of the parakeets mentioned above; they are both shy and retiring in disposition, and are therefore not suitable pets. All of them are in the habit of sleeping with their head turned back with the beak hidden amongst the feathers.

(172) THE RED-SIDED ECLECTUS.

(ECLECTUS PECTORALIS—(Müller.))

Hindi and Bengali—*Hirman* or *Hiraman tota*, the green bird;
Lalmohan, the red bird.

Though a native of New Guinea, the species is well known in Bengal; it is not, however, generally known that the sexes differ so widely, and that the green-coloured bird is the male, and the scarlet one the female, of the same species.

Hab.—New Guinea.

LENGTH OF LIFE IN CAPTIVITY.

A male has been living since 1882: it appears from the number of deaths that take place among the new arrivals that these birds are somewhat difficult to acclimatize.

TREATMENT IN CAPTIVITY.

Housing.—May be kept singly or in pairs in iron cages like those recommended for the cockatoos; they are not much given to biting the wire; extremely susceptible as they are to cold, great care must be bestowed upon them, at least for the first few weeks after their arrival.

Food.—Fruits, grains, and seeds constitute their principal food in captivity; bread, biscuits and vegetables being occasionally allowed as a change: so long as the birds do not become well acclimatized, much attention should be paid to feeding them according to their taste and inclination; green shoots of corn are always agreeable to them, particularly during the first stage of their captive life.

OBSERVATIONS ON THEIR HABITS.

They are listless and inactive birds, but become very tame and affectionate; a few of them learn to talk, but their power in this respect is very limited; although generally quiet, they sometimes scream very loud.

(173) THE RED-WINGED PARRAKEET.

(APROSMICTUS ERYTHROPTERUS—(*Lath.*))

Description.—The general colour of the plumage green; back, shoulders and the wing coverts black; a lengthened patch of crimson gives the bird its distinctive characteristic; beak orange red: the sexes are said to differ, the female having no red patch on the wing.

Hab.—Northern Australia.

LENGTH OF LIFE IN CAPTIVITY.

A specimen lived for about six months only.

(174) THE KING PARRAKEET.

(APROSMICTUS SCAPULATUS—(*Kuhl.*))

Description.—The head, neck, and all the under surface of the body, as well as the under tail-coverts, red; the rest of the plumage green; the tail greenish-black: the female is less gorgeously coloured, having the prevailing colour of its plumage dirty green, with a faint shade of red about its breast; the young males also have no red.

Hab.—New South Wales.

LENGTH OF LIFE IN CAPTIVITY.

A little over five years.

(175) THE LARGE-BILLED PARRAKEET.

(TANYGNATHUS MEGALORHYNCHUS—(*Bodd.*))

Description.—Total length 15 inches; general colour of the plumage green; feathers of the shoulders greyish-black, margined yellow and tipped black; the upper tail-coverts bright green; the whole under surface yellowish-green; the maxilla orange red; mandible light yellow.

Hab.—Gilolo and Ceram.

LENGTH OF LIFE IN CAPTIVITY.

Nearly seven years: specimens have also been living for the last five years.

(176) THE SUMATRAN LARGE-BILLED PARRAKEET.

(TANYGNATHUS SUMATRENSIS—(*Raffles.*))

Description.—Smaller and much lighter in colour than the preceding; forehead, crown and nape green, mottled with yellow; upper back light yellow; breast and under abdomen light yellow; under surface of the quills light ashy.

Hab.—Sumatra.

LENGTH OF LIFE IN CAPTIVITY.

There is no record of the period during which it lived in the garden; it died soon after its arrival.

TREATMENT IN HEALTH.

Housing.—The king parrakeet appears to do well in an aviary; but for the large-billed and the blue-crowned parrakeets cages are to be preferred: wherever a king parrakeet is placed it must have ready access to water for bathing, especially during the hot weather.

Food.—Grains of various kinds and vegetables.

OBSERVATIONS ON THEIR HABITS.

The mental capacities of these parrakeets do not appear to be susceptible of much training, and none of them ever attain the same degree of tameness as most birds of the same family do; but the king parrakeet is a harmless creature and not given to scratching or biting.

(177) THE INDIAN LORIKEET.

(LORICULUS VERNALIS—(*Sparr.*))

In Hindi and Bengali all the lorikeets are known as *latkan*, i.e., hanging parrakeets, without any specific distinction.

Description.—Total length about $5\frac{1}{2}$ inches; the general colour of the plumage green; throat blue; rump and upper tail-coverts crimson; quills tinged with blue on the outer webs; breast tinged with yellow: the sexes differ, the female having no blue on the throat.

Hab.—Found in the Sub-Himalayan regions, the jungles of the Malabar coast, the hill ranges of Assam, Sylhet, Tipperah; extends through the Indo-Burmese countries to Burmah, the Malayan peninsula, and the Andaman Islands.

LENGTH OF LIFE IN CAPTIVITY.

Although there is no record of individual specimens, these birds generally do well.

(178) THE CEYLONESE HANGING PARRAKEET.

(LORICULUS ASIATICUS—(Lath.))

Description.—Total length about 5 inches ; the general colour of the plumage green ; forehead and crown deep red, washed with orange on the nape ; rump and upper tail-coverts also deep red ; some of the quills edged with blue ; cheeks and the area round the eyes and the whole of the under surface pale green, tinged with blue in the foreneck.

Hab.—The Island of Ceylon.

LENGTH OF LIFE IN CAPTIVITY.

A pair of them lived close upon seven years.

(179) THE BLUE-CROWNED HANGING PARRAKEET.

(LORICULUS GALGULUS—(Linn.))

Description.—Length $4\frac{1}{2}$ inches to 5 inches ; general colour of the plumage green ; French blue flake on the crown ; a triangular patch of golden yellow on the back ; upper tail-coverts red ; a red patch on the breast ; bill black ; the female differs from the male in having no blue patch on the head and no red on the breast ; the golden yellow of the back also faint.

Hab.—Malacca.

LENGTH OF LIFE IN CAPTIVITY.

This species also has not done well in captivity, so that none of them have ever lived more than two years.

TREATMENT IN HEALTH.

Housing.—A large aviary, where they can fly about at pleasure and enjoy some freedom, is no doubt very desirable for these birds, but such an arrangement has its disadvantages also ; the birds get lost in the space and, amongst others, the food intended for them—and they require somewhat special feeding—is robbed by other birds ; they starve or eat anything that comes in their way, become ill and die ; so that it is on the whole better to keep them in large cages such as that recommended for the liothrix (No. 23), either by themselves, or with such harmless birds as the liothrix and Java sparrows ; the cage should be furnished with logs of wood or cocoanut shells to enable them to find employment and exercise in pecking ; they must have access to water both for drinking and bathing ; avoid as much as possible keeping them in very small cages.

Feeding.—The majority of deaths that have happened among these birds shortly after their arrival must unfortunately be attributed to ignorance of their food ; the general practice among the dealers is to feed them on boiled rice, a most unsuitable diet for birds which in

their wild state feed on fruits and the saccharine juice of flowers: the erroneousness of the dealers' practice has only been proved by costly experience in this garden. In captivity they thrive on sugarcane, plantains and other luscious fruits; biscuits, bread, boiled sweet potatoes and vegetables may occasionally be given.

Breeding.—In consequence of unsuitable accommodation they have never bred in this garden; they have, however, frequently during the spring shown tendencies towards breeding; and the experiment of assigning a good sized cage, with suitable nesting accommodation in some retired spot to properly matched lorikeets, might be successful.

Transport.—During the season when sugarcane is available there need be no difficulty, as with proper care it may be made to last a good while; at other times plantains, raisins, dates, and sweet potatoes may be provided.

Nothing is known about their ailments in captivity.

OBSERVATIONS ON THEIR HABITS.

The lorikeets are not unfrequently caged in Bengal; and, if well acclimatized, get very tame; they are, however, never demonstrative, neither are they endowed with much intelligence, but they are very active cheerful creatures, and have a pleasant chirping call note, which they continue to utter when something unusual attracts their attention, or sometimes without any cause; their flight is rapid, and they possess the peculiar habit of resting or sleeping pendant with their heads downwards.

(180) THE TORQUOISINE GRASS PARRAKEET.

(EUPHEMA PULCHELLA—(Shaw.))

Description.—Of the size of a crested ground parrakeet; the general colour of the plumage above, olive green; the forehead, lores and the cheeks sky blue; the border of the wing also the same colour; an elongated red patch on the wing; under parts of the body yellow; sexes differ, the female having less blue about the face and the wings, and the wing spot is reddish-brown instead of red.

Hab.—New South Wales.

LENGTH OF LIFE IN CAPTIVITY.

A pair obtained in July 1878 lived for about three months 'only, having never recovered from the delicate condition in which they arrived, nor was their habitation suitable.

(181) THE UNDULATED GRASS PARRAKEET.

(MELOPSITTACUS UNDULATUS—(Shaw.))

Budgerica of the Calcutta bird-sellers.

Description.—The ground colour of the plumage greenish-yellow; forehead and face yellow; the feathers of the nape, sides of the neck, back

and wing coverts greyish black, margined with yellow, giving it a finely variegated appearance, especially about the neck; on each side of the beak are series of dark blue spots (number and position vary in different individuals), the cere of the nostrils in the adult bird blue; in the adult female very faint blue or cream coloured, becoming brown or brownish when maturity is attained; the total length about $7\frac{1}{2}$ inches.

Hab.—South Australia.

LENGTH OF LIFE IN CAPTIVITY.

Identification is difficult, as the older specimens get mixed up with the later acquisitions. It is certain, however, that some of those obtained in 1880 are still flourishing.

(182) THE ROSE-FACED LOVE-BIRD.

(AGAPORNIS ROSEICOLLIS—(*Vieill.*))

Description.—Total length about 5 to $5\frac{1}{2}$ inches; the general colour of the plumage light green; forehead scarlet; the cheeks and throat rosy-red; the rump and upper tail-coverts washed with blue; tail crossed with reddish-brown and black bands, there being a tinge of blue between the reddish-brown and the black; beak horny light grey; legs plumbeous.

Hab.—South Africa.

(183) THE GREY-HEADED LOVE-BIRD.

(AGAPORNIS CANA—(*Gmel.*))

Description.—Smaller than the preceding; the general colour of the plumage green; head, neck, and upper breast pale ashy; the female differs from the male in having the head, neck and breast much lighter, and in having black spots on the tail.

Hab.—Madagascar.

LENGTH OF LIFE IN CAPTIVITY.

Specimens have been living since 1883.

TREATMENT IN HEALTH.

Housing.—Unsuitable accommodation hastened the death of the torquoise parakeets. Though the cage was protected from rain, the house was damp and exposed to draughts—conditions most unfavourable to parrot life; the undulated grass parakeets have done well here; they may be safely kept in roomy cages in a verandah which can be closed in. They are sociable creatures and like to live in company; fresh turf should frequently be laid at the bottom of the cage, as they enjoy pecking at grass and earth. They are ordinarily not fond of

bathing, but a shallow trough of water should be allowed them during the summer, or an occasional shower-bath applied with a garden syringe. The love-birds do well in cages.

Food.—Millet, hemp and canary seeds, and vegetables; fruits, bread, biscuits and sugarcane are also very acceptable to them; whenever possible, shoots of green corn should be given them, and occasionally salt. All these grain-eating birds must have some gravel or coarse sand placed in the cage.

Breeding.—The undulated grass parakeets have only once bred in the garden. Of the five white eggs laid, only two were hatched, the rest were broken, perhaps by other birds: an empty cocoanut, or an old cigarbox with a circular hole in the side, large enough to admit the bird, makes excellent nesting accommodation; even when not breeding they largely use their nests, and may often be seen pecking at the fibres of the cocoanut: some sand and plaster off the wall of an old building should be strewn on the floor of the cage to supply them with lime. They are prevented from breeding by the presence of strange birds and by want of privacy.

Transport.—Hundreds of undulated grass parakeets are constantly imported packed up in very small cages. This is cruel. There ought not to be more than a dozen birds placed in a cage about 18 inches long, 12 inches broad, and about 9 inches high.

TREATMENT IN SICKNESS.

They are generally hardy, but deaths frequently occur in a large stock of grass parakeets. They are not known to suffer from any special diseases.

OBSERVATIONS ON THEIR HABITS.

Undulated grass parakeets are noisy, always active and supremely busy about nothing. They make the best of their captive life, and appear to enjoy it far better than any other birds in a similar situation. They become very tame, but not while living in the midst of a large company. The love-birds are silent, quiet and amiable creatures, and when kindly treated grow tame and affectionate.

(184) THE PURPLE-CAPPED LORY.

(*LORIUS DOMICELLA*—(*Linn.*))

Description.—The prevailing colour of the plumage scarlet; an interrupted band of yellow stretches across the breast; the wings olive green; head deep purple, which in certain lights appears black; a broad band of light purple on the tail; beak orange red; the female closely resembles the male, but is lighter coloured.

Hab.—The Moluccas and the adjacent islands.

LENGTH OF LIFE IN CAPTIVITY.

Some of them have lived for over six years.

(185) THE BLACK-CAPPED LORY.

(LORIUS LORI—(Linn.))

Description.—Forehead, crown, and occiput black; sides of the head, throat, and breast carmine red; the back of the neck and the shoulders violet blue; the lower back, the rump, and the upper tail coverts carmine red; wings green, the feathers being tipped black (in very healthy specimens the green of the wings has a metallic lustre); the tail red at its upper half, but violet towards the end; the lower breast, abdomen and under tail coverts violet blue, extending on each side upwards and outwards to meet the same colour at the shoulder; the under surface of the tail yellowish brown; beak orange red. Specimens obtained at different times have been found to vary somewhat in colour and size, especially in the former.

Hab.—New Guinea and the adjacent islands.

LENGTH OF LIFE IN CAPTIVITY.

This species has generally been short-lived in this garden, none having ever survived more than four years.

(186) THE CHATTERING LORY.

(LORIUS GARRULUS—(Linn.))

Description.—The general colour of the plumage red; wings olive green; the lower ends of the quills black; an irregular patch of light yellowish olive on the back; the lower ends of the tail feathers greenish black; thigh greenish blue; bill ivory white; total length $9\frac{1}{2}$ to 10 inches.

Hab.—The Moluccas.

LENGTH OF LIFE IN CAPTIVITY.

No specimen is known to have lived more than two years.

(187) THE RED LORY.

(LORIUS RUBRA—(Gmel.))

Description.—The general colour of the plumage scarlet red; the lower tail coverts and the shoulders blue.

Hab.—Amboyna.

LENGTH OF LIFE IN CAPTIVITY.

No record.

(188) THE BLUE-STREAKED LORY.

(EOS RETICULATA—(*Mull. et Schl.*))

Description.—The general colour of the plumage carmine red; dark violet stripes on the mantle; shaft stripes grey and blue; tail brownish black

Hab.—Timor Laut.

LENGTH OF LIFE IN CAPTIVITY.

Specimens have been living since 1887; others have lived for about eighteen months.

(189) THE BLUE-BREASTED LORY.

(EOS INDICA—(*Gmel.*))

Description.—The general colour of the plumage is carmine red; a blue band stretches across the top of the head from one eye to another; there are other irregular blue lines about the head and neck; the breast and the back blue; the wings red with black and purple edgings; the lateral tail feathers purple; the thigh blue; the sexes differ, the female being somewhat smaller and its markings fainter.

Hab.—The Moluccas.

LENGTH OF LIFE IN CAPTIVITY.

A pair obtained in 1880 lived for about seven months only.

(190) THE SMALL PURPLE-CAPPED LORY.

(EOS GUEBIENSIS—(*Scop.*))

Description.—Forehead and crown red; occiput purple, which is continuous with a broad band of the same colour forming a half collar on the nape; back red; wings violet with black edgings; a patch of violet on the wing coverts; throat and upper breast purple; lower breast red; abdomen purple; total length about $7\frac{1}{3}$ to $7\frac{1}{2}$ inches.

Hab.—The Moluccas.

LENGTH OF LIFE IN CAPTIVITY.

Although there is no record of the actual period during which specimens have lived in the garden, they have, as a rule, done well here.

(191) THE ORNAMENTAL LORY.

(TRICHOGLOSSUS ORNATUS—(*Linn.*))

Description.—Forehead, crown, and occiput violet black, in some specimens bluish black, with a tinge of violet; red bands, commencing from behind the eyes, meet at the nape; a yellow band on each side

of the neck; the rest of the upper plumage green; the first quill feather greyish black, the rest of them green at the outer web, greyish black at the inner; cheeks, chin, throat and breast red; throat and breast being barred with black; the abdomen green mottled with yellow; the upper three-fourths of the inner webs of the outer tail feathers reddish brown; the outer tail feathers tipped yellow; total length $7\frac{3}{4}$ to 8 inches:

Hab.—The Moluccas.

LENGTH OF LIFE IN CAPTIVITY.

On an average specimens have lived for about five years.

(192) THE BLUE MOUNTAIN, OR SWAINSON'S LORY.

(TRICHOGLOSSUS NOVÆ-HOLLANDÆ—(Gmel.))

Description.—The head and throat purplish blue, with minute light blue streaks; the nape greenish yellow; the breast and each side of the abdomen red; the feathers being margined yellow and purple, give the whole a scaly appearance; middle of the abdomen blue; vent and thigh light green; the rest of the plumage green; the beak orange red.

Hab.—Australia.

LENGTH OF LIFE IN CAPTIVITY.

They have generally done well in this garden. There is, however, no record of their length of life.

(193) THE SCALY-BREASTED LORY.

(TRICHOGLOSSUS CHLOROLEPIDOTUS—Kuhl.)

Description.—Head and nape beautiful blue; neck band and breast orange red; belly black.

Hab.—New South Wales.

LENGTH OF LIFE IN CAPTIVITY.

About a year and six months.

(194) THE RED-COLLARED LORY.

(TRICHOGLOSSUS RUBRITORQUATUS—(Vig. et. Horsf.))

Description.—Green; feathers on the back yellowish, underneath the wing red.

Hab.—Australia.

LENGTH OF LIFE IN CAPTIVITY.

Nine years.

TREATMENT IN HEALTH.

Housing.—The lories, especially the purple and black-capped, are sometimes kept as pets, and although confined in small iron cages, or chained to a perch, some have been known to live a number of years; an aviary is certainly to be preferred; but unless the place is large and the temper of the birds known, different species should not be mixed up; experience has shown that the black and the purple-capped lories, and their congeners, fare badly when placed with the trichoglossi from Australia. The lories live happily with other birds, in a large aviary, but the trichoglossi have to be lodged separately: both of them are excessively fond of bathing. For this purpose suitable provision should be made; particular and constant attention should be paid to the cleanliness of an aviary where a number of soft-billed parrots, and indeed all birds feeding on soft food, live.

Food.—The purple and black-capped lories, and other allied species, thrive on a mixed diet of bread and milk, fruits, roots, vegetables and insects; the trichoglossi feed on seeds, fruits, vegetables, bread and milk, boiled eggs; they all like sweet things, so that bread soaked in honey and water are very welcome to them; fibrous food is said to be beneficial to their system; whether this is so or not, they immensely enjoy nibbling at plants and shrubs, especially of a fibrous nature; sand and gravel should be strewed over the bottom of the cage or the floor of the aviary, as, even for soft-billed birds, some grit is necessary for digestion. Feeding vessels should be placed in such a way that their contents may not be soiled by the droppings of birds.

Breeding.—None of these birds have ever bred in this garden, although a solitary female of a purple-capped lory has sometimes produced eggs.

Transport.—Be careful about cold and draughts.

TREATMENT IN SICKNESS.

Lories have now and then been known to die of *fits* and *inflammation* of the chest; *diarrhœa* is not uncommon among them.

OBSERVATIONS ON THEIR HABITS.

Most of these birds become easily reconciled to captivity; their power of speech is limited, but they surpass other parrots in intelligence and amiable qualities; the lories, as a rule, are remarkably tame and demonstrative, and grow much attached to their owner and keeper; though generally peaceful, they are sometimes troublesome to the other inmates. A small purple-capped lory was found one morning persistently pecking at a crown pigeon, and even holding on to its tail when the latter attempted to escape by flying. They all have very leanly habits, and a lory may often be seen trying to clean its plumage by rubbing or washing.

(195) PENNANT'S BROADTAIL.

(PLATYCERCUS PENNANTI—(*Lath.*))

Description.—Prevailing colour of the plumage scarlet; a patch of bluish grey at the base of the lower beak; the shoulder and the wing coverts also of the same colour; primaries black, edged with bluish grey; neck slightly mottled black; the back and the secondaries, including a portion of the wing coverts, black, broadly edged with red (in some specimens there is an olive tinge on the back); tail greyish blue; bill horny white; legs plumbeous; total length about 18 inches.

Hab.—Australia and New South Wales.

LENGTH OF LIFE IN CAPTIVITY.

As yet a little over five years.

(196) BARRABAND'S BROADTAIL.

(PLATYCERCUS BARRABANDI—(*Swain.*))

Description.—The general colour of the plumage deep green; the forehead, chin, throat, cheeks, yellow with traces of scarlet about the cheek; a broad semi-lunar band of scarlet lines the yellow of the throat; the quills are edged light blue; the under surface of the tail greyish black; the beak orange red; legs blackish; total length about 15 inches.

Hab.—New South Wales.

LENGTH OF LIFE IN CAPTIVITY.

About three years only.

(197) THE ROSE-HILL BROADTAIL.

(PLATYCERCUS EXEMIUS—(*Shaw.*))

Rosella of the Calcutta bird-sellers.

Description.—Head, crown, occiput, sides of the head, and breast red; chin and throat white; abdomen olive green; rump red; back beautifully variegated, the black feathers being edged with yellow; the upper tail coverts greenish; middle tail feathers bluish, lateral ones ashy; total length about 10 inches.

Hab.—New South Wales.

LENGTH OF LIFE IN CAPTIVITY.

Seven years represent the longest period during which a pair have lived in the garden.

(198) THE YELLOW-RUMPED BROADTAIL.

(PLATYCERCUS FLAVEOLUS—(*Gould.*))

Description.—The general colour of the plumage yellow; forehead and sides of the neck red; chin and throat violet; primaries ashy brown, some being edged faint bluish; wing coverts faint bluish, edged white; feathers of the back brownish black, broadly edged with yellow; middle tail feathers brownish black, lateral ones bluish; the length about the same as the rose-bill parrakeet.

Hab.—New South Wales.

LENGTH OF LIFE IN CAPTIVITY.

Fifteen months only.

(199) THE YELLOW-COLLARED BROADTAIL.

(PLATYCERCUS SEMITORQUATUS—(*Quoy. et Gaim.*))

Description.—The general colour of the plumage green; a narrow crimson band on the forehead; head and its sides brownish black, tinged with faint bluish about the cheeks; a yellow band encircles the back of the neck; the outer webs of the primaries bluish, the inner being blackish brown; the lateral tail feathers also bluish; length about 16 inches.

Hab.—West Australia.

LENGTH OF LIFE IN CAPTIVITY.

Over five years.

(200) THE NEW ZEALAND PARRAKEET.

(CYANORAMPHUS NOVÆ ZEALANDÆ—(*Gmel.*))

Description.—The general colour of the plumage green, of different shades and intensity at different parts of the body; forehead, crown, cheeks, and the rump red; total length about 9 inches.

Hab.—New Zealand.

LENGTH OF LIFE IN CAPTIVITY.

The only specimen that was ever imported arrived in a delicate state of health and survived nine months.

TREATMENT IN HEALTH.

Housing.—An aviary is always preferable to a cage in lodging the broadtails, but as all the members of this group are not equally

peaceful, sometimes difficulty is experienced in housing a species that is known, or an individual that turns out, to be quarrelsome. The barrabands' broadtail has been found to be the worst in this respect: the male rose-hill parakeets also become very spiteful during the breeding season, especially if the females are in the same cage, but otherwise a rose-hill lives in perfect amity with other birds. The broad-tails are as impatient of cold and draughts as other parrots, but in Bengal they also suffer from the opposite extreme; in the sultry hot days of April and May, with fiery gusts of wind, parrots, like many other birds, suffer dreadfully. At such times a shower-bath of cool water should be administered in the afternoon. Aviaries with light roofs become very hot during the summer, but the heat may be easily alleviated if quick-growing trees be planted round or strong and heavy creepers grow over them. In planting trees and creepers care should be taken not to exclude the morning sun, which is very grateful to the birds, especially during the winter. New Zealand parakeets are such quiet and shy birds that, unless numerous, they should be kept in single cages.

Food.—Grains, seeds, and vegetables constitute the principal food of the broadtails and the New Zealand parakeet; crumbs of bread may also be occasionally given throughout the year. Indian-corn and hem-pseeds should be given sparingly during the hot weather, but sugarcane, soaked gram, and vegetables are recommended. In their wild state these birds feed largely on insects and worms, and in captivity they will pick up maggots intended for other birds living with them, but this should be prevented if possible, as insect food is injurious to them in confinement. A small quantity of rock salt should be kept in one corner of the aviary containing the broadtails, especially the Pennants'; all should have free access to clean drinking-water. Being generally delicate, especially on arrival, the New Zealand parakeets should be carefully watched during the first few weeks of their altered life; they are supposed to feed on insects, and may be allowed a few in conjunction with other food.

Breeding.—None of the broadtails have ever bred in this garden, but this is owing more to the want of suitable accommodation than to any want of inclination.

Transport.—Though not endowed with the formidable cutting power of a cockatoo, some of the broadtails are destructive; in providing a travelling cage for them, not only should it be made sufficiently strong, but logs of old wood and cocoanut shells should be provided to allow them to exercise their beaks upon.

TREATMENT IN SICKNESS.

Diarrhœa and *cold* are very common among the broadtails, the results of unsuitable dieting and exposure.

OBSERVATIONS ON THEIR HABITS.

Pennants' broadtails are gregarious in habits, and even in captivity they flock together; they are naturally shy, quiet and peaceable; Barrabands' broadtails, on the contrary, are spiteful and bad

tempered, and seldom become tame; in an aviary they live chiefly on the floor, searching for seeds, insects and grubs; the rose-hill is the most sprightly and noisy of this group; the yellow-collared is a very quiet and gentle creature, although at times apt to become cross and sulky, probably from being teased by visitors. The New Zealand parrakeet, as already remarked, is delicate and shy; though said to be a ground bird, the specimen in the garden was never seen on the floor of the aviary, except at the time of feeding.

(201) THE GREATER VASA PARROT.

(CORACOPSIS VASA—(Linn.))

Description.—The general colour of the plumage dull greyish black beak white; total length about 16 inches.

Hab.—Madagascar.

LENGTH OF LIFE IN CAPTIVITY.

A specimen lived for about six years.

(202) THE LESSER VASA PARROT.

(CORACOPSIS NIGRA—(Linn.))

The general colour of the plumage the same as of the preceding species, but its size is smaller.

Hab.—Madagascar.

LENGTH OF LIFE IN CAPTIVITY.

A specimen has been living since 1886.

(203) THE GREY PARROT.

(PSITTACUS ERYTHACUS—Linn.)

Description.—The ground colour of the plumage ashy grey, the feathers of the head, neck and breast being margined with pearl whitish; the tail short and red; bill black; iris yellow.

Hab.—Africa.

LENGTH OF LIFE IN CAPTIVITY.

Though generally hardy, none of these birds lived more than five years in the garden.

TREATMENT IN HEALTH.

Housing.—That both the greater vasa and the grey parrots should be so short-lived was chiefly owing to unsuitable habitation; generally speaking, they should be treated like the cockatoos.

Food.—To be fed like the cockatoos.

OBSERVATIONS ON THEIR HABITS.

The vasa parrots become almost as tame as grey parrots or cockatoos; they whistle beautifully, but have never been known to utter a single syllable; one of the grey parrots exhibited in this garden was for some time a lady's pet, and thereby acquired most winning manners.

(204) THE BLUE AND YELLOW MACAW.

(ARA ARARAUNA—(Linn.))

Description.—All the upper part deep blue, with a greenish shade on the forehead and wing coverts; cheeks white, crossed by a few lines of black feathers; chin black; the rest of the under surface yellow; bill black; legs dark red colour; about the size of a rose-crested cockatoo, but looks larger from the length of the tail.

Hab.—South America.

LENGTH OF LIFE IN CAPTIVITY.

The longest period has been six years and a few months.

(205) THE RED AND YELLOW MACAW.

(ARA CHLOROPTERA—Gray.)

Description.—General colour of the plumage red; large bare area round the eyes white; a band of red velvety feathers at the base of the bill; wing coverts yellow; quills blue; maxilla white with a black tip; mandible black.

Hab.—South America.

LENGTH OF LIFE IN CAPTIVITY.

A specimen has been living since 1881.

(206) ILLIGER'S MACAW.

(ARA MARACANA—(Vieill.))

Description.—Forehead and rump red; the general colour of the plumage green of various shades, much lighter about the breast and

under surface generally; border of the wings blue; tail dark reddish brown, with bluish tips.

Hab.—Brazil.

LENGTH OF LIFE IN CAPTIVITY.

A specimen lived for about eighteen months only.

(207) THE YELLOW-HEADED CONURE.

(CONURUS JENDAYA—(*Gmel.*))

Description.—Head and neck golden yellow; back and wings green, part of the wing edged blue; breast reddish yellow; tail green and blue; bill black.

Hab.—South America.

LENGTH OF LIFE IN CAPTIVITY.

A specimen has been living since 1884.

(208) THE YELLOW-CHEEKED AMAZON.

(CHRYBOTIS AUTUMNALIS—(*Linn.*))

Hab.—Honduras.

(209) THE RED-THROATED AMAZON.

(CHRYBOTIS COLLARIA—(*Linn.*))

Hab.—Jamaica.

(210) THE YELLOW-FRONTED AMAZON.

(CHRYBOTIS OCHRYOCEPHALA—(*Gmel.*))

Hab.—Guiana.

All the amazons are birds of green colour of varied shades, and distinguished from each other by markings as indicated in the specific names given above.

LENGTH OF LIFE IN CAPTIVITY.

Except the last-named species, which has been living in the garden for upwards of three years, none of the others have survived more than about fifteen months.

TREATMENT IN HEALTH.

Housing.—The macaws should be treated like the cockatoos; the amazons also do equally well as cage birds; the conures are generally harmless and may be kept in an aviary.

Food.—Grains, seeds, vegetables, fruits, bread, and biscuits.

TREATMENT IN SICKNESS.

Macaws have been known to contract the very bad habit of plucking their own feathers—a disease to which parrots in captivity appear to be particularly subject; it is believed to be generally brought on by want of occupation, or excitement caused by too nourishing a diet; the taste of blood which the bird gets from sucking the feathers stimulates it to persist in the habit, which gradually becomes so inveterate as to baffle treatment. Tin collars, bathing with wine, or a decoction of aloes or quassia, and various other remedies have been recommended. One of the macaws in this garden continued for four years a victim to this habit, and of the various remedies tried nothing succeeded better than a change of habitation.

OBSERVATIONS ON THEIR HABITS.

The macaws have almost the same habits as the cockatoos; the amazons are quiet, sedate, and generally undemonstrative birds.

(211) THE INDIAN BARN OWL.

(*STRIX JAVANICA*—*Gmel.*)

Bengali—*Lakhmi-penchá.*

Hab.—Found all over India and Ceylon, and extends to Burmah and Malayana; at least two forms of barn owl are commonly met with—one very light coloured, and the other darker.

LENGTH OF LIFE IN CAPTIVITY.

Bears captivity well, but the species being very common and well known is not always exhibited.

(212) THE GRASS OWL.

(*STRIX CANDIDA*—*Tickell.*)

Diagnosis.—Above brown, feathers with black shafts, and minutely spotted with a subterminal white; beneath yellowish white, with small brown specks.

Hab.—Found throughout India, but nowhere very common; it has been also recorded from Tenasserim, Philippine Islands, and Formosa.

LENGTH OF LIFE IN CAPTIVITY.

A specimen from Assam lived for about five years.

(213) THE BROWN FISH OWL.

(KETUPA CEYLONENSIS—(*Gmel.*))

Hindi—*Ulee*. Bengali—*Hatum penchá*.

Hab.—Found all over India, Burmah, and Ceylon, and is said to extend to China also.

LENGTH OF LIFE IN CAPTIVITY.

Three or four of them lived for over ten years, and were, after that period, set at liberty, in consequence of their habitation being dismantled.

(214) THE JAVAN FISH OWL.

(KETUPA JAVANENSIS—(*Less.*))

Hab.—Java, Sumatra, Borneo, and the Malay peninsula.

LENGTH OF LIFE IN CAPTIVITY.

A specimen obtained in 1880 lived for about seven or eight months only.

(215) THE ROCK-HORNED OWL.

(BUBO BENGALENSIS—(*Frank.*))

Hab.—Found throughout India and Ceylon; rare in Lower Bengal.

LENGTH OF LIFE IN CAPTIVITY.

Nearly twelve years.

(216) THE FOREST EAGLE OWL.

(BUBO NEPALENSIS—(*Hodgs.*))

The distinctive characteristic of this species is its prominent ear tufts, about three inches long.

Hab.—The central regions of Nepal, and the lower ranges of the North-West Himalayas.

LENGTH OF LIFE IN CAPTIVITY.

One of a pair obtained in 1878 lived till 1884.

(217) THE INDIAN SCOP'S OWL.

(SCOPS PENNATUS—*Hodgs.*)

Hab.—India, Ceylon, Burmah, and China ; nowhere very abundant.

(218) THE SPOTTED OWLET.

(CARINE BRAMA—*Temm.*)

Hab.—Common throughout India. Does not appear to bear captivity well.

(219) THE BROWN WOOD OWL.

(SYRNIUM NEWARENSE—*Hodgs.*)

Hab.—The Himalayas. There is no record as to the length of time it lived in the garden.

(220) THE MARSH HARRIER.

(CIRCUS ÆRUGINOSUS—(*Linn.*))

Hindi—*Tika bauri*. Bengali—*Mat-chil*.

Hab.—Found almost all over India, including the lower ranges of the Himalayas ; it is identical with the European species.

Does not appear to bear captivity well.

(221) THE SHIKRA.

(ASTUR BADIUS—(*Gmel.*))

Hab.—The whole of India, extending to Ceylon, Burmah, and Malayana.

LENGTH OF LIFE IN CAPTIVITY.

Specimens obtained in 1877 lived for more than seven years ; being extremely common about here it is not generally exhibited.

(222) THE LONG-LEGGED EAGLE.

(AQUILA HASTATA—(Less.))

Hindi—*Guti-mar-baz*.

Hab.—More common in Western Bengal than in other parts of India, though both the specimens exhibited in this garden were obtained from North-Western India.

LENGTH OF LIFE IN CAPTIVITY.

None of them survived more than fifteen months; this may be attributed to want of suitable habitation.

(223) THE CRESTED HAWK EAGLE.

(SPIZÆTUS CIRRHATUS—(Gmel.))

Hindi—*Shāhbāz*.

Hab.—Central and Southern India, extending to Ceylon; the specimen exhibited in the garden came from Orissa.

LENGTH OF LIFE IN CAPTIVITY.

From September 1882 to July 1890.

(224) THE JAPANESE HAWK EAGLE.

(SPIZÆTUS ORIENTALIS—(Temm.))

Hab.—Said to have been obtained from Japan.

(225) THE BLACK-CRESTED EAGLE.

(LOPHOÆTUS OCCIPITALIS—(Daud.))

Description.—Adult female always chocolate-brown with some of the feathers on the back and wing coverts inclining to paler brown; head rather darker blackish with a black occipital crest; base of the crest feathers and a few spots on the outer upper tail coverts white; tail dark brown, the base white, the others whity brown; quills dark brown, white at base, banded with paler brown above, whitish below, the secondaries more indistinctly, the inner ones quite uniform with the rest of the back; under wing coverts for the most part white, the inner ones and the tips of the greater ones brown; axillaries brown; legs white, more or less washed with brownish; forehead whitish; bill bluish; black at tip; cere pale yellow, feet light yellow; claws black; total length 21·3; adult male 21 inches.—*J. E. Gray*.

Hab.—The whole of Africa.

(226) THE CRESTED SERPENT EAGLE.

(SPILORNIS CHEELA—(*Lath.*))Bengali—*Tile baj*.

Hab.—Found throughout India, ascending the Himalayas up to 7,000 feet; it extends as far east as China and Formosa.

(227) THE BATELEUR EAGLE.

(HELOTARSUS ECAUDATUS—(*Daud.*))

Description.—Head, which is much crested, and the entire neck all round glossy black; hind neck and back maroon, paler on the lower back; scapulars black; wing coverts bronzy brown; the greater coverts blackish at the base; quills blackish, externally shaded with grey, tips black; tail deep maroon; cere and orbits coral red; bill black; feet coral red; adult male 21 inches; adult female larger, about 24 inches.

Hab.—Africa.

LENGTH OF LIFE IN CAPTIVITY.

About three years.

(228) THE WHITE-BREASTED SEA EAGLE.

(HALIÆTUS LEUCOGASTER—(*Gmel.*))Hindi—*Kohassa*.

Hab.—Found all over India; the specimens exhibited in the garden were mostly obtained from the Sunderbuns.

LENGTH OF LIFE IN CAPTIVITY.

A pair lived from 1876 to 1884.

(229) PALLAS'S SEA EAGLE.

(HALIÆTUS LEUCORYPHUS—(*Pall.*))Hindi—*Macharang*. Bengali—*Korul, Bala*.

Hab.—Common in Bengal and North-West India.

LENGTH OF LIFE IN CAPTIVITY.

Five to six years.

(230) THE BRAHMINY KITE.

(HALIASTER INDUS—(*Bodd.*))Bengali—*Sunker chil*.

Hab.—Found throughout India.

(231) THE HOUSE KITE.

(MILVUS GOVINDA—*Sykes.*)Bengali—*Cheel.*

Hab.—Common and abundant throughout India, ascending the Himalayas up to about 8,000 feet.

Both this and the preceding species live in a wild state within the gardens.

(232) THE BLACK-WINGED KITE.

(ELANUS CÆRULEUS—(*Desf.*))

Description.—The upper part grey; lores and supercilium black; shoulders, winglet, and lesser wing coverts deep glossy black; lower parts white; forehead and ear coverts also white.

Hab.—Throughout India and greater part of Africa.

(233) THE PEREGRINE FALCON.

(FALCO PEREGRINUS—(*Tunst.*))Hindi—*Byhri.*

Hab.—Europe and North Asia; found in India during the cold weather only; the bird is, however, well known in Bengal.

LENGTH OF LIFE IN CAPTIVITY.

A specimen obtained in 1877 lived till the end of 1884, when, having accidentally injured itself, it had to be killed; it bears captivity well.

(234) THE SHAHIN FALCON.

(FALCO PEREGRINATOR—(*Sundev.*))Hindi—*Shahin.*

Hab.—Found throughout the whole of India from the Himalayas to the extreme south of India, extending through Afghanistan to Western Asia.

(235) THE LUGGAR FALCON.

(FALCO JUGGER—*J. E. Gray.*)Hindi and Bengali—*Lagghur.*

Hab.—Common throughout India.

LENGTH OF LIFE IN CAPTIVITY.

No record : known to bear captivity well.

(236) THE SACER, OR CHERUG FALCON.

(FALCO SACER—*Gmel.*)

Hindi—*Chargh.*

Hab.—South-East Europe, Western Asia, and rarely Himalayas ; during the cold weather it is also found in other parts of India.

There is no record of the length of life.

(237) THE INDIAN HOBBY.

(FALCO SEVERUS—*Horsf.*)

Hindi—*Dhuter.*

Hab.—Himalayas, extending through Assam to Burmah, Malayan Peninsula, Java, and the Philippines ; not uncommon in the vicinity of Calcutta during the cold weather.

(238) THE KESTRIL.

(TINNUNCULUS ALAUDARINUS—(*Linn.*))

Hindi—*Narzanak.* Bengali—*Baj.*

Hab.—The whole of Europe and Northern Asia, migrating in winter into North China, the Indian peninsula, and North-East Africa ; occasionally wandering into Western and Southern Africa and the Seychelles.—*J. E. Gray.*

During the cold weather it is common in the neighbourhood of Calcutta, and even within the gardens.

LENGTH OF LIFE IN CAPTIVITY.

Over eight years.

(239) THE RED-FOOTED FALCON.

(TINNUNCULUS VESPERTINUS—(*Linn.*))

Hab.—Eastern and Southern Europe.

LENGTH OF LIFE IN CAPTIVITY.

A few months only.

(240) THE BRAZILIAN CARACARA.

(POLYBORUS BRAZILIENSIS—(*Gmel.*))

Description.—The crown of head crested, and of a greyish brown colour; sides of the face and neck buffy white, barred with narrow black lines; back, rump, and upper tail coverts dark brown, with narrow white bars; tail buffy white, with a broad brown band at the tip, and the lower part beautifully adorned with brown cross bars; neck and breast white with distinct dark coloured cross bars; the lower breast and abdomen blackish brown; the feathers of the lower breast with whitish margin; bare crop patch yellow; cere and bare space round the eye carmine brown, tinged yellow; bill horny blue; feet yellow; total length about 23 inches.

Hab.—LaPlata, Patagonia, the deserts between the rivers Negro and Colorado, West Patagonia, and Terra del Fuego.

LENGTH OF LIFE IN CAPTIVITY.

A single specimen obtained in September 1879 is still alive and well.

(241) THE LONG-BILLED VULTURE.

(GYPS INDICUS—(*Scop.*))

(242) THE INDIAN WHITE-BACKED VULTURE.

(GYPS BENGALENSIS—(*Gmel.*))

Both the above vultures have occasionally been exhibited while awaiting transmission to other gardens.

(243) THE WHITE SCAVENGER VULTURE.

(NEOPHRON GINGINIANUS—(*Lath.*))Hindi—*Kál-moorgh.*

Hab.—Found throughout the greater part of India, but not common in Central and Northern India; it is somewhat common in Behar, extending as far east as Deoghur and Madhupore in the Sonthal Pergunnahs, and occasionally in Lower Bengal.

TREATMENT IN HEALTH.

Housing.—Most of these birds do better singly or in pairs, and accommodation should be provided accordingly; on the other hand, in a house measuring 40' x 15' and 19' high as many as fifteen falcons and

eagles have been observed to live peacefully. The Brazilian cara-cara, which has lived so long and well, has always been kept singly, in a tolerably large cage, where it can move about freely: though generally hardy birds, exposure to draughts and rain has been known to cause inflammation of the lungs in some of them. Owls generally do not object to live together, but care should always be taken to eliminate bad tempered birds; dark corners or retiring boxes should be provided; the vultures should always be kept by themselves, as they are generally quarrelsome and obtrusive. The house or cage should be thoroughly cleaned every day.

Feeding.—They are all carnivorous, and as a rule are fed upon beef, frogs, fish, and sometimes rats, in captivity; meat should be given with pieces of bones attached, as they enjoy picking the bones clean, especially the Brazilian cara-cara, hobby, and some other species: common grass snakes may, now and then, be given to the crested serpent eagle; Pallas's sea eagles also enjoy snakes in addition to fish and small turtles and crabs. A small bird is *bonne bouche* to most of them, and should occasionally be given. A quantity of shingles or small stones should be kept strewn about the floor of their cages; they swallow these, especially after feasting upon a bird, and after some time eject them with the feathers of the bird sticking around: all should have ready access to drinking-water.

Transport.—For exportation, tame birds that have lived for some time in captivity should be preferred, and each bird separately accommodated.

OBSERVATIONS ON THEIR HABITS.

Owls are proverbially grave and sedate birds, and, as is well known, like hiding themselves in dark corners; if tame, they take no notice of anybody approaching the cage, but sit perfectly motionless, staring with dazed wild look; the quivering of the mandibles, which is now and then visible, signifies displeasure; quite different, however, is the manner of an owl that has not become reconciled to captivity; it will instantly fly against the side of the cage farthest from the intruder, ruffle its plumage, clatter its bill and hiss repeatedly. All the birds of prey are more or less self-possessed when tame, but such as have not yet become reconciled to captivity, look scared and confused, and flutter themselves to death on the cage being approached; except at feeding time, none of them are ever observed on the ground; they sit without stirring, on a perch, the whole day and night; the same bird has been observed to occupy the same spot of a particular perch as long as it lived in this garden. Owls are never heard to call during the day; some falcons call at night only.

(244) THE SPOONBILL.

(PLATALEA LEUCORODIA—*Linn.*)

Hindi—*Chamuch buza*. Bengali—*Chinta* or *Sinta*.

The characteristic feature of the bird is its broad, flat, and depressed bill, like a spatula.

Hab.—Europe, Asia, and Africa ; scarce in Lower Bengal ; somewhat common in Upper India during the winter.

LENGTH OF LIFE IN CAPTIVITY.

Spoonbills at one time did not thrive in this garden ; latterly a specimen became reconciled to captivity ; it completely cast off its old dirty feathers, and looked lively and gay in its new plumage.*

(245) THE PELICAN IBIS.

(TANTALUS LEUCOCEPHALUS—*Forst.*)

Hindi—*Janghal*. Bengali—*Rám Jhankar* or *Sona Jangha*.

During the latter end of the rains it loses much of the rosy red tint of its tertiaries, reassuming it again in the spring ; the young birds are generally of a brownish grey colour.

Hab.—India, Burmah, and Ceylon.

LENGTH OF LIFE IN CAPTIVITY.

Specimens living since 1883.

(246) THE SHELL IBIS.

(ANASTOMUS OSCITANS—(*Bodd.*))

Hindi—*Gungla, Ghongal*. Bengali—*Shamukbhanga*.

Hab.—Particularly abundant in Northern Bengal.

LENGTH OF LIFE IN CAPTIVITY.

This species has not unfortunately done well in this garden, none having survived more than a few months.

(247) THE BLACK-HEADED IBIS.

(IBIS MELANOCEPHALUS—*Linn.*)

Description.—Head and neck nude, and black ; the rest of the plumage white ; the bare skin of the wing-bone beneath pinkish red, which is visible when the bird is on the wing ; bill long, slender, curved, and channelled.

Hab.—It is met with over the greater part of India and Ceylon, the Indo-Burmese countries, Southern China, Siam, Cochin China, the Malay peninsula, Sumatra, Java, and Borneo.—*Oates*. For this garden specimens have chiefly been obtained from Dinagepore in Northern Bengal, and Arracan.

LENGTH OF LIFE IN CAPTIVITY.

Specimens have been living upwards of ten years.

* After having lived over two years it met with an accidental death.

(248) THE BLACK IBIS.

(INOCOTIS PAPILLOSUS—(Temm.))

Hindi—*Buza*.

Description.—The colouring of the upper part of the body fuscous brown; upper tail coverts black; wings steel blue with purple reflexion; a patch of white on the lesser wing coverts; lower parts blackish brown; the head black, with a patch of red papillæ on the back of the head.

Hab.—Found throughout the greater part of India.

LENGTH OF LIFE IN CAPTIVITY.

Specimens have now and then been exhibited in the garden, but there is no record of the period during which any of them lived.

(249) THE GLOSSY IBIS.

(PLEGADIS FALCINELLUS—(Linn.))

Hindi—*Kewari* or *Kowar*.

The bronze metallic lustre of the plumage is most noticeable during the breeding season.

Hab.—It has a wide range of distribution, being found throughout Asia, Australia, North Africa, and south of Europe; common in India during the cold weather.

LENGTH OF LIFE IN CAPTIVITY.

A few have been living since 1880.

(250) THE SCARLET IBIS.

(EUDOCIMUS RUBER—Linn.)

Of an uniform scarlet colour.

Hab.—South America.

LENGTH OF LIFE IN CAPTIVITY.

A specimen lived from July 1880 to August 1888.

(251) THE FLAMINGO.

(PHÆNICOPTERUS ANTIQUORUM—Temm.)

Hindi—*Hans* or *Bag-hans*. Bengali—*Kanthunti*.

Its long neck and legs, and the bent down bill, are very characteristic; the extent and intensity of the rosy red colour of the head, back, tail and the wing coverts vary somewhat in different specimens; the colouring of the females is generally subdued; the young birds are

dusky white, and do not assume the adult plumage till after the first moult; a specimen is known to be living in captivity for the last few years without assuming the adult plumage; flamingos vary in size.

Hab.—Europe, North Africa, and greater part of Asia; in India it is found throughout the country—rarer in some parts, abundant in others: in the south, common about Madras, and in the Pulicat and Chilka lakes, in Northern India, the Sambhur lake appears to be their head-quarters; rarely found in Bengal.

LENGTH OF LIFE IN CAPTIVITY.

Although one or two of them have lived for over five years, as a rule they have not flourished in this garden. The younger specimens appear to bear captivity better than the adult birds, which generally pine and die.

(252) THE PURPLE HERON.

(ARDEA PURPUREA—*Linn.*)

Hindi—*Nari*. Bengali—*Lál Anjan*, *Lál Kank*.

Hab.—Europe, Asia, and Africa; in India, Burmah, and Ceylon it is commonly met with in wet and marshy tracts.

LENGTH OF LIFE IN CAPTIVITY.

Upwards of seven years.

(253) THE COMMON HERON.

(ARDEA CINEREA—*Linn.*)

Hindi—*Kabud*, *Khyra*. Bengali—*Anjan*.

Hab.—Found throughout Europe, Asia, and Africa.

LENGTH OF LIFE IN CAPTIVITY.

Specimens have occasionally been exhibited, but it does not appear to bear captivity well.

(254) THE LARGE WHITE EGRET.

(HERODIAS ALBA—(*Linn.*))

Hindi—*Malang Bagla*. Bengali—*Dhan bak* or *Bagla*.

The most characteristic feature of this species is its beautiful, decomposed, and soft train feathers which it assumes during the breeding season; the colour of the bill and the facial skin changes according to the season of the year, being respectively black and bright green during the breeding season, and yellow at other times.

Observation.—A specimen has been known in the summer not to assume the full breeding plumage, or the usual bright green of the facial skin; this may have been due to old age, or impaired health, consequent upon an accident which it had sustained resulting in the compound fracture of its left leg.

Hab.—Found throughout India and Ceylon; scarce in Lower Bengal.

LENGTH OF LIFE IN CAPTIVITY.

A specimen has been living in the garden since April 1879; this does not represent the length of its captivity, as prior to its inclusion in this collection it lived for some years in the Viceroy's menagerie at Barrackpore.

(255) THE LESSER EGRET.

(HERODIAS INTERMEDIA—*Van Hass.*)

Hab.—Found throughout India and Ceylon, and extends through Burmah to Malayana.

LENGTH OF LIFE IN CAPTIVITY.

Only a few months.

(256) THE CATTLE EGRET.

(BUBULCUS COROMANDUS—(*Bodd.*))

Hindi—*Gai-bagla*. Bengali—*Bak*.

Very common in Bengal.

Hab.—India, Burmah, and Ceylon; it also inhabits Southern China, Cochin China, and extends through the Malayan peninsula to Java, Borneo, Celebes, and the Philippine Islands. Found in a wild state within the garden.

(257) THE POND HERON.

(ARDEOLA GRAYI—(*Sykes.*))

Hindi—*Andhe bagla* (i.e., blind heron); the Paddy-bird of Europeans.

Hab.—Most abundant everywhere in India.

Found in a wild state within the garden.

(258) THE BLUE BITTERN.

(ARDEIRALLA FLAVICOLLIS—(*Lath.*))

Hindi and Bengali—*Lal bogla*.

Hab.—Found throughout the greater part of India, Ceylon; also said to occur in China and Malayana.

(259) THE CHESTNUT BITTERN.

(ARDETTA CINNAMOMEA—(*Gmel.*))Hindi and Bengali—*Lāl-bagla*.

Hab.—India, Ceylon, Burmah, the Andaman Islands, China, Malayan peninsula, Java, and the Philippines.

(260) THE LITTLE YELLOW BITTERN.

(ARDETTA SINENSIS—(*Gmel.*))Bengali—*Kat-bogla*.

Hab.—India, Burmah, Ceylon, the Malayan peninsula, and some of the islands of the Malayan Archipelago.

(261) THE NIGHT HERON.

(NYCTIARDEA NYCTICORAX—(*Linn.*))Bengali—*Kowa-dauk*.

The young birds have no occipital plumes. This species is readily distinguished from the herons by its short neck and tarsus, and thick-set form.

Hab.—Europe, Africa, North America, and Asia; in India it is found throughout the country, extending through Burmah to Malayana.

LENGTH OF LIFE IN CAPTIVITY.

A specimen lived over ten years in this garden.

(262) THE ADJUTANT.

(LEPTOPTILUS ARGALA—(*Lath.*))Hindi and Bengali—*Har-gila*.

A common and well-known bird in Bengal.

Hab.—India, Burmah, the Malayan peninsula, Siam, Cochin China, Sumatra, Java, and Borneo. It is not so common in Calcutta as it used to be some twenty years ago; it is mostly seen during the wet weather, becoming scarce at the approach of the winter.

LENGTH OF LIFE IN CAPTIVITY.

Appears to bear captivity well; although some of them have been noticed to pine and die within a few days of their capture, most of them live contentedly and well until they are sent off to other institutions.

(263) THE LESSER ADJUTANT.

(LEPTOPTILUS JAVANICUS—(*Horsf.*))Hindi—*Chandiari*, *Bang-gor*. Bengali—*Madan-tiki*.

Top of the head entirely bald and horny ; a large white neck ruff covers the sides of the neck and breast.

Hab.—India, Burmah, and the Malayan peninsula; in India they are nowhere abundant, but more common in Assam and Sylhet than in Upper Provinces; rarely found in Lower Bengal.

LENGTH OF LIFE IN CAPTIVITY.

About six years.

(264) THE BLACK-NECKED STORK.

(XENORHYNCHUS ASIATICUS—(*Lath.*))Hindi—*Lohajang*. Bengali—*Ram salik*.

Description.—Head and neck glossy black with green and purple reflexions; middle and greater coverts, tertiaries, and the tail also glossy black with greenish reflexions; rest of the plumage white; bill black; irides brown; legs red; the young birds are grey.

Hab.—Found in India and Burmah, extending through the Malayan peninsula to Australia; in India it is common in Central India and Lower Bengal.

LENGTH OF LIFE IN CAPTIVITY.

Specimens have lived for more than eight years.

(265) THE WHITE-NECKED STORK.

(DISSURA EPISCOPUS—(*Bodd.*))Hindi and Bengali—*Manikjor*.

Very common in Bengal.

Hab.—India, Burmah, Ceylon, and extends through the Malayan peninsula to the islands of the Indian Archipelago.

LENGTH OF LIFE IN CAPTIVITY.

The species appear to bear captivity well, as some of them obtained in 1880 are still alive and well.

(266) THE WHITE STORK.

(CICONIA ALBA—(*Linn.*))Hindi—*Lag-lag*, *Dhak*.

Entirely white with the exception of the scapulars, quills, and the greater wing coverts, which are black; bill and legs red.



ZOOLOGICAL GARDEN - CALCUTTA.



Photo etching.

Survey of India Office, Calcutta, December 1890.

The Water-Fowl Enclosure.

Hab.—Europe, Asia, and Africa; it visits India during the cold weather only, and is then common in the North-Western Provinces and the Deccan; not known to have been found in Lower Bengal.

LENGTH OF LIFE IN CAPTIVITY.

A few have been living since 1883.

TREATMENT IN HEALTH

The spoonbill, ibis, flamingo, heron, adjutant and stork require, with slight variations, identical treatment with respect to *housing* and *feeding*, and are therefore grouped together.

Housing.—The accommodation for animals in captivity should be as close an imitation of their wild haunts as it is possible to provide. The various wading birds mentioned above should therefore have an area of a large tank or lake, with gently sloping and well turfed banks, set apart for them; for the adjutants, storks, flamingos, and even for the spoonbill, a light enclosure, about four feet high, is enough; but the ibises, herons, egrets, &c., require a covered space (see under ducks and geese, p. 306). Like most other animals in captivity, many of these birds sometimes exhibit great jealousy at the introduction of a stranger amongst them, and do not cease to worry it until it is removed; the large egret and the black-necked stork have been found to be the greatest culprits in this respect; some of the wading birds may have to be exhibited in other places, with shallow tanks built in the floor, which, though good in themselves, can never be as comfortable for them as the bank of a tank or lake; such places are, however, particularly adapted for the night herons, as affording concealment and solitude during the day. In order to prevent the storks and adjutants, &c., which are kept simply in an enclosure, from flying away, their wings require to be clipped periodically, but the most practical and simplest method of doing it once for all is to remove the first joint of one wing and cauterise the stump.

Food.—In their wild state the spoonbill feeds on aquatic insects, small crustacea and molluscs, frogs and fish, and as most of them are easily obtainable, no difficulty need be experienced in feeding it; the specimen now living in the collection is fed upon prawns and small fish, and does not object to take minced meat occasionally. The pelican ibis finds a great deal of its own food by frequently stirring up by its right foot the mud at the bottom of the water near the edge of a tank, and seizing and devouring crabs, frogs or fish that it may chance to find; but in addition to this a small quantity of meat and fish may be daily supplied to each of them. The shell ibis is rather a difficult bird to find food for in captivity, as it chiefly lives upon molluscs; it has never yet thriven in this garden, and therefore nothing can be confidently said about it. The black-headed, glossy, and scarlet ibises thrive on minced meat, small fish and prawns; those that have become tame greedily devour bits of bread and biscuit thrown to them; they also search and find a great deal of their own food, consisting of aquatic insects, frogs and molluscs. The herons and storks also live upon fish and meat; the adjutants and the black-necked storks are

chiefly fed upon the latter; most of the storks are destructive to snakes, but in captivity the white-necked stork, or the "manickjor," has been particularly noticed to kill and devour common grass snakes (*Tripidonotus stolatus*) on many occasions, and once a young cobra. The food of the flamingos in captivity consists of bran and barley (*bajrah*) mixed with water; some of them also become accustomed to, and thrive on, boiled rice; like the pelican ibis, they also search for food by stirring up the mud at the edge of the tank, and much of the success in keeping them depends upon the place where they can have opportunities of finding their own food.

Breeding.—None of these birds have ever bred in captivity, but for the last few years large numbers of egrets have been regularly breeding in a wild state within the garden, selecting for this purpose a large island overgrown with trees, shrubs and undergrowths.

Transport.—Flamingos and black-necked storks are sometimes very cruelly treated during the transit by rail, lasting sometimes for two or three days; their legs are bent and drawn up under the body, and a piece of gunny or old canvas tied round the whole; the practice is most reprehensible.

OBSERVATIONS ON THEIR HABITS.

A healthy spoonbill is an active, playful bird, and fond of exhibiting its amusing antics; the movement of its bill sideways, when feeding, is very noticeable. The pelican ibis is sometimes heard to clatter its long and strong mandibles at night; its method of searching food has already been noticed. The shell ibis has unfortunately been found to be listless and morose, perhaps from want of suitable food. The black-headed, glossy and scarlet ibises become wonderfully tame in a short time, and are very inquisitive; they pass a great deal of their time, in the morning and evening, in searching for their own food in shallow water, but when not otherwise employed they roost on perches. The herons and egrets are quarrelsome birds; the storks and the pelican ibises have a very comical way of spreading out their wings after a morning ablution. The flamingos move with wonderful swiftness and ease across water, from one end of a tank to another, using the wings for support and the legs for motion, and although the whole movement is most rapidly performed, each stroke of the foot is distinctly heard. The storks have sometimes been observed to treat a stick or a twig like a snake: it holds the object between the mandibles and beats it in the same manner as it does a snake.

(267) THE LARGE CORMORANT.

(*PHALACROCORAX CARBO*—(*Linn.*))

Hindi—*Gho-gur*. *Pani-kowa*.

In captivity they do not assume their breeding plumage regularly.

Hab.—Europe, Asia, Africa, and Australia. The range of its distribution is said to extend also to North America. Not very common in Lower Bengal, and rare in south of India; more abundant in North-West India, and in the rivers of the Himalayas.

LENGTH OF LIFE IN CAPTIVITY.

One of a pair obtained in 1887 is still alive; prior to its inclusion in this collection it lived for some years in the menagerie of the late King of Oudh.

(268) THE LITTLE CORMORANT.

(*PHALACROCORAX PYGMÆUS*—(*Pall.*))

Bengali—*Pan-kowti*.

Hab.—South-East Europe, Northern Africa, and Southern Asia, extending to the islands of the Malayan Archipelago. Found throughout India, and extremely common in Bengal.

LENGTH OF LIFE IN CAPTIVITY.

Very hardy and bears captivity well; no record kept of the period during which any of them have lived.

(269) THE INDIAN SNAKE-BIRD.

(*PLOTUS MELANOGASTER*—(*Gmel.*))

Hindi—*Banwa*. Bengali—*Goyar*.

The long snake-like neck is the most characteristic feature of this bird, which is well known in Lower Bengal.

Hab.—India, Ceylon, Burmah, Malayan peninsula, Sumatra, Java, Borneo, and the Celebes; very common in the rivers and swamps of Eastern and Northern Bengal.

LENGTH OF LIFE IN CAPTIVITY.

Nearly seven years.

(270) THE SPOTTED-BILLED PELICAN.

(*PELECANUS MANILLENSIS*—(*Gmel.*))

Pelicans are designated *howasil* in Hindi, and *gagan-bher* in Bengali, without any specific distinction being recognized. The prevailing colour of the plumage of this species is grey.

Hab.—Greater part of India, Ceylon, Burmah, Malayan peninsula, Java, Borneo, and the Philippine Islands; the specimens obtained for this collection mostly came from Eastern Bengal.

LENGTH OF LIFE IN CAPTIVITY.

None have yet lived for more than four years.

(271) THE LESSER WHITE PELICAN.

(PELECANUS JAVANICUS—(*Horsf.*))

(272) THE MITRED PELICAN.

(PELECANUS MITRATUS—*Licht.*)

The lesser white and mitred pelicans have been identified to belong to the same species.

The characteristic feature of the species is that the females only have the crest.

Hab.—India, Burmah, the Malayan peninsula, Sumatra, Java, Borneo, and the Philippines.

LENGTH OF LIFE IN CAPTIVITY.

Upwards of seven years.

(273) THE GREY LAG GOOSE.

(ANSER CINEREUS—*Meyer.*)Hindi—*Hans* or *Karhans*.

The species varies somewhat in size and colouring of the plumage and bill.

Hab.—A cold weather visitant to India, being found during the winter throughout the whole of Upper India; rarely met with in Bengal. It is found throughout Europe.

LENGTH OF LIFE IN CAPTIVITY.

Specimens have been living since 1882.

(274) THE BARRED-HEADED GOOSE.

(ANSER INDICUS—(*Lath.*))

It is readily distinguished from other geese by the presence of two black bars on the occiput and nape.

Hab.—India and Burmah in the winter, and Central Asia in summer. It has been received from the following places in India:—Lucknow, Monghyr, Chota Nagpore, Purneah, Dacca, and Nuddea.

LENGTH OF LIFE IN CAPTIVITY.

Living since 1882.

(275) THE CHINESE GOOSE.

(ANSER CYGNOIDES—(*Linn.*))

Resembles the tame goose of Bengal, but larger, with a black bill, and orange fleshy legs and feet.

Hab.—China; probably found in Assam also.

(276) THE BLACK AND WHITE GOOSE.

(ANSERANAS MELANOLEUCA—*Less.*)*Hab.*—Australia.

LENGTH OF LIFE IN CAPTIVITY.

Since January 1882.

(277) THE COTTON TEAL.

(NETTAPUS COROMANDELIANUS—*Gmel.*)Hindi—*Girja* or *Girri*. Bengali—*Belia-hans*, *Ghangerel*.

There is no white patch in the primaries of the female, which is smaller and duller in colouring.

Hab.—Abundant in the deltas of the Ganges and Brahmaputra; also found in many other parts of India.

LENGTH OF LIFE IN CAPTIVITY.

None has yet lived for more than five months.

(278) THE CANADA GOOSE.

(BERNICLA CANADENSIS—(*Linn.*))

The characteristic feature of this species is its black head and neck, with a broad patch of white spreading from the neck over the cheeks on each side.

Hab.—North America.

LENGTH OF LIFE IN CAPTIVITY.

1879 to 1885.

(279) THE UPLAND GOOSE.

(BERNICLA DISPAR—*Ph. el. Landb.*)

A female exhibited in the garden had its head and neck coloured cinnamon-brown; abdomen lighter brown and barred with black; upper back also barred; rump and tail feathers dark brownish. Head vulture-like.

Hab.—Chili and Argentina.

LENGTH OF LIFE IN CAPTIVITY.

A little over one month; it lived for about a year in a private menagerie.

(280) THE BLACK SWAN.

(CYGNUS ATRATUS—*Lath.*)

The prevailing colour of the plumage black ; quill feathers white ; the tips of the tertiaries curled up.

Hab.—Australia.

LENGTH OF LIFE IN CAPTIVITY.

Since February 1882.

(281) THE MUTE SWAN.

(CYGNUS OLOR—(*Gmel.*))

Individuals of both sexes differ in size, but the males are always larger than the females ; the female has no tubercle at the base of the upper mandible, or a very small one ; it has also less black about the bill, and the neck is very slender ; the immature birds of both sexes are greyish brown or grey, and the males have no tubercle : they take about two years to assume their adult white plumage.

Hab.—Found throughout Europe, extending during the winter to Northern Africa, Egypt, and Asia Minor, and as far east as Western India.

LENGTH OF LIFE IN CAPTIVITY.

Living since 1880.

(282) THE BLACK-NECKED SWAN.

(CYGNUS NIGRICOLLIS—(*Gmel.*))

Hab.—Antarctic America.

(283) THE NUKHTA, OR COMB DUCK.

(SARCIDIORNIS MELANONOTA—(*Forst.*))

Hindi—*Nukhta*.

The size of the fleshy protuberance of the bill is much reduced during the non-breeding season ; the females have no comb.

Hab.—Central and Western India, Ceylon, British Burmah ; rare in Bengal, although specimens have now and then been received from Rungpore and Serajunge.

LENGTH OF LIFE IN CAPTIVITY.

Very hardy, and flourish well in captivity here.

(284) THE LARGER WHISTLING TEAL.

(DENDROCYGNA FULVA—(*Gmel.*))Hindi—*Silli*. Bengali—*Murghabi*.

It resembles the next species in general appearance, but is larger and brighter in colouring.

Hab.—India, Burmah, Madagascar, &c.; frequently found in the neighbourhood of Calcutta and in other places in Lower Bengal.

There is no record of its length of life in captivity.

(285) THE LESSER WHISTLING TEAL.

(DENDROCYGNA JAVANICA—(*Horsf.*))

Hindi—*Silhahi*, *Silli*. Bengali—*Saral*. *Soreil* and *Harili-hans* in Eastern Bengal.

Hab.—India, Burmah, Siam, the Malay peninsula, Sumatra, Java, and Borneo; it also occurs in Ceylon and the Andaman and Nicobar Islands. In some parts of the country it is a seasonal visitant, but in others a permanent resident; large flocks of them are met with in the swampy tracts of Lower Bengal during the cold weather.

LENGTH OF LIFE IN CAPTIVITY.

It is not improbable that some of the birds obtained in 1879 are still alive.

(286) THE RED-BILLED TREE DUCK.

(DENDROCYGNA AUTUMNALIS—(*Linn.*))

General colour of the plumage rufous brown; bill brick red.

Hab.—America.

LENGTH OF LIFE IN CAPTIVITY.

Living since 1884.

(287) THE WHITE-FACED TREE DUCK.

(DENDROCYGNA VIDUATA—(*Linn.*))

The prevailing colour of the plumage dark brown; face white.

Hab.—Africa and South America.

LENGTH OF LIFE IN CAPTIVITY.

Nearly five years.

(288) THE BRAHMINY DUCK.

(TADORNA CASARCA—(Linn.))

Hindi—*Surkhab*. Bengali—*Chaka-chaki*. *Boogri* in Eastern Bengal.

In captivity the seasonal black collar of the neck sometimes disappears permanently, or only a trace becomes visible at the breeding season.

Hab.—Central Asia, Persia, Mesopotama, Asia Minor, the entire northern portions of Africa, and India, in many parts of which they are most abundant during the cold weather.

LENGTH OF LIFE IN CAPTIVITY.

It has never done well in this garden, none having yet lived for more than four years.

(289) THE COMMON SHELDRAKE.

(TADORNA VULPENSER—(Fleming.))

Hindi—*Shah-chakwa*, *Sufaid-surkhab*.

Description.—Head and neck black with greenish reflexions; scapulars and primaries black; greater coverts bronze green; outer webs of some of the secondaries orange brown; the rest of the plumage white; a broad band of ferruginous brown encircles the breast, shoulders, and upper back; bill red; irides brown; legs fleshy red. The colouring of the female is much subdued, and it also wants the pectoral band.

Hab.—Found throughout Europe, the greater part of Asia, and Northern Africa. In India, nowhere very common and quite unknown in the south. The specimens obtained for this garden were all obtained from the Monghyr district.

There is no record of its length of life in captivity.

(290) THE WILD DUCK.

(ANAS BOSCAS—Linn.)

Hindi—*Nilsir*.

Description.—Head and neck emerald green, very deep or nearly black about the forehead; a white collar round the neck; chest dark chestnut; abdomen and sides greyish white, with finely undulated brown lines; an elongated patch of blue on the wings; the central feathers of the tail curled upwards; bill pale greenish yellow; legs orange. The female is smaller than the male, and of a brown colour of different shades.

The white collar of the neck is sometimes very indistinct behind.

Hab.—Europe and Asia. Found throughout the year in Kashmir, but it is a cold weather visitant to other parts of India, where it is generally common in the North-West.

LENGTH OF LIFE IN CAPTIVITY.

A specimen obtained in March 1878 lived for about a year only.

The wild duck is the origin of the domestic duck, of which several breeds have from time to time been exhibited.

(291) THE AUSTRALIAN WILD DUCK.

(ANAS SUPERCILIOSA—*Gmel.*)

Hab.—Australia.

(292) THE SPOTTED-BILLED DUCK.

(ANAS PÆCILORHYNCHA—*Penn.*)

Hindi—*Garampai, Gagrai.*

The males are slightly larger than the females. In other respects they look very much alike, except that in adult males the colour of the legs is intense coral red, whereas in the females it is very dull; in younger specimens of both sexes the legs are orange yellow; the base of the upper mandible is coloured red, and the nail and a small patch of the lower mandible bright yellow. Adult males in captivity have sometimes been found to want the red at the base of the upper mandible.

Hab.—India, Burmah, and Ceylon; outside India it extends as far west as Afghanistan and as far east as China.

LENGTH OF LIFE IN CAPTIVITY.

Specimens have been living since 1882.

(293) THE PINK-HEADED DUCK.

(RHODONESSA CARYOPHYLLACEA—(*Lath.*))

Hindi—*Lalsira.* Bengali—*Saknal.*

The colouring of the plumage in both sexes differs much in different individuals, irrespective of season.

Hab.—India. Mr. Hume considers Behar and the rest of Bengal north of the Ganges and west of the Brahmaputra as its head-quarters; he includes the Nepal and Oudh Terai, the central and eastern portions of Oudh, the Benares Division of the North-Western Provinces, the whole of the rest of Bengal, Assam, and Manipur, and the East Coast littoral as far south as Madras, within its normal range, throughout which it is, except in certain isolated localities, very rare. Specimens exhibited in the garden have mostly been obtained from Purneah and Bhagalpore.

LENGTH OF LIFE IN CAPTIVITY.

About six years.

(294) THE COMMON TEAL.

(QUERQUEDULA CRECCA—(*Linn.*))Hindi—*Murghabi*. Bengali—*Bigri*.

The ground colour of the plumage is subject to much variation; some specimens, especially the females, have no spots at all.

Hab.—Europe, Asia, North Africa, China, &c. In India it is very common everywhere during the cold weather.

(295) THE GARGANEY, OR THE BLUE-WINGED TEAL.

(QUERQUEDULA CIRCIA—(*Linn.*))Hindi—*Patari*. Bengali—*Giria*.

The colour of the sides of the head has been found to vary from pinkish white to greyish brown.

Hab.—Europe, Asia, and Africa. It is less abundant in India than the common teal.

No record has been kept of their length of life in captivity.

(296) THE PIN-TAILED DUCK.

(DAFILA ACUTA—(*Linn.*))Hindi—*Sink-par*. Bengali—*Dig-hans*. *Sholoncho* in East Bengal.

Length of the tail varies considerably among the males; their plumage also becomes much changed during the rains, so that a male can hardly be distinguished from a female.

Hab.—Europe, Asia, and Africa. In India it is found in every part of the country during the cold weather.

LENGTH OF LIFE IN CAPTIVITY.

Specimens have been living since 1886. This is long enough time for a pin-tail's life in captivity here, as it is one of those ducks that leave the country early and migrate very far to the north during the summer.

(297) THE WIDGEON.

(MERECA PENELOPE—(*Linn.*))

"The conspicuous, broad, more or less speckly black band, down the middle of the throat, sometimes extending the whole front of the neck," which is said to be generally present in the males, has often been observed to be wanting in those exhibited in this garden; the creamy buff patch on the forehead appears to be a constant character in mature birds.

Hab.—Europe, Asia, Africa, and the Atlantic coasts of North America. During the winter it is found throughout the greater part of India, but nowhere very abundant.

LENGTH OF LIFE IN CAPTIVITY.

Over six years.

(298) THE GADWELL.

(CHAULELASMUS STREPERUS—(Linn.))

Hindi—*Mila*. Bengali—*Peeling-hans*.

Hab.—Europe, Asia and North America.

LENGTH OF LIFE IN CAPTIVITY.

Specimens obtained in February 1877 disappeared in April.

(299) THE SHOVELLER.

(SPATULA CLYPEATA (Linn.))

Hindi—*Tokurwalla*. Bengali—*Panta-mukhi*.

No females have ever been exhibited in this garden.

Hab.—Europe, Asia, North Africa, &c. Very widely distributed in India during the cold weather.

(300) THE SUMMER DUCK.

(ÆX SPONSA—(Linn.))

Description.—Forehead dull grey; crown pale creamy and tufted; patches of black on the sides of the head and neck; throat and neck white; general colour of the plumage brown; primaries, rump, and tail coverts black; legs and feet slaty; bill black, extremity orange; total length about 22 inches.

Hab.—North America.

LENGTH OF LIFE IN CAPTIVITY.

About six years.

(301) THE MANDARIN DUCK.

(ÆX GALERICULATA—(Linn.))

Description.—This duck is readily distinguished from all others by its gorgeous plumage, the arrangement of some of which is also fantastic. The forehead of the adult male is deep green; crown and back of the head chestnut; feathers of the crest deep bluish green; back of the neck, back, wing coverts, rump, and upper tail coverts olive; lower part of the neck and sides of the breast deep chestnut, immediately behind which are irregular black and white bands; the inner web of the inner secondary is developed into fan shape: it is coloured red and edged with black and white lines; the outer web rich blue; the flanks pale reddish brown, becoming much paler towards the extremity of the feathers and transversely rayed with irregular lines of black; under surface pure white. The female is a sober-coloured, ordinary looking bird;

head, neck, and crest dark brownish slaty grey; transverse lines down the sides of the upper mandible; a circle round the eye and continued to the sides of the head and chin, white.

Hab.—China.

LENGTH OF LIFE IN CAPTIVITY.

While some have proved hardy and borne captivity well, others never recover from the dilapidated condition in which they arrive. Specimens have been living since 1886.

(302) THE CRESTED DUCK.

(FULIGULA CRISTATA—*Ray.*)

Hindi—*Dubaru ablac.*

The length and thickness of the tuft vary somewhat in different individuals; irides golden yellow.

Hab.—Europe and Asia. In India it is common in Central and Southern India during the cold weather.

(303) THE WHITE-EYED POCHARD.

(FULIGULA NYROCA—(*Güld.*))

Bengali—*Bhuti hans.*

Even in perfectly adult birds the irides have been found to be brownish grey or greyish white.

Hab.—Europe, Africa, and Asia; during the winter it is common throughout the greater part of India, including Lower Bengal.

LENGTH OF LIFE IN CAPTIVITY.

Specimens have been living upwards of seven years.

(304) THE RED-CRESTED DUCK.

(BRANTA RUFINA—(*Pall.*))

Hindi—*Lal Conch.* Bengali—*Hero-hans, Chobra-hans.*

Hab.—Southern Europe, Algiers in Northern Africa, Eastern and Western Turkistan, Persia, India, &c.

Never have done well in captivity here.

(305) THE RED-HEADED POCHARD.

(AYTHYA FERINA—(*Linn.*))

Bengali—*Lal Muriya.*

Pochards with pink irides are not uncommon.

Hab.—Europe, Asia, and Northern Africa. In India it "occurs as a cold-season migrant to the northern two-thirds of the Empire."

Does not bear captivity well.

(306) THE EIDER DUCK.

(SOMATERIA MOLLISSIMA—(Linn.))

Hab.—Europe and Northern Asia; it seldom visits India.
A specimen lived for a few days only.

(307) THE BROWN-HEADED GULL.

(LARUS BRUNNCEIEPHALUS—*Jerd.*)

Hindi—*Pani-kawa*, or water crow in Bengal.

Hab.—Found in the sea-coasts throughout the greater part of India; they also occur far inland, and specimens have sometimes been obtained from Northern Bengal.

LENGTH OF LIFE IN CAPTIVITY.

Bear captivity well; specimens have lived upwards of seven years.

(308) THE GREAT BLACK-HEADED GULL.

(KROIKOCEPHALUS ICHTHYÆTUS—(Pall.))

The only specimen ever obtained came from Goalundo in Furreedpore.

(309) THE LARGE SWALLOW PLOVER, OR THE
EASTERN PRATINCOLE.

(GLAREOLA ORIENTALIS—(Leach.))

Hab.—Southern and Eastern Europe, Western Asia, and Northern Africa; during the winter it is found almost all over India.

There is no record of the length of life of this and the following birds.

(310) THE RED-WATTLED LAPWING.

(LOBIVANELLUS INDICUS—(Bodd.))

Vernacular name—*Titi Titiri* in different parts of India.

Hab.—Common throughout India.

(311) THE COMMON SNIPE.

(GALLINAGO SCOLOPACINUS—(Bonap.))

Hab.—Northern Europe and Asia; during the cold weather very abundant everywhere in India.

(312) THE BRONZE-WINGED JACANA.

(METOPIDIUS INDICUS—(*Lath.*))Bengali—*Jal-pipi*, *Karatiya*, *Kattoi*.*Hab.*—India, Burmah, and Malayana.

(313) THE PHEASANT-TAILED JACANA.

(HYDROPHASIANUS CHIRURGUS—(*Scop.*))Hindi—*Piho*. Bengali—*Dal-kakra*.*Hab.*—India and Burmah.

TREATMENT IN CAPTIVITY.

Housing.—A large sheet of water with grassy banks, planted here and there with trees and shrubs to afford shade and cover, is the most suitable accommodation for aquatic birds generally. But for practical purposes it has been found necessary to enclose a long narrow arm of a lake with light iron fencing about 4 feet high to keep the pelicans, swans, flamingo, storks, &c.; while for the ducks, geese, and other smaller aquatic birds a light covered structure has been built over another end of the ornamental waters: to give the birds shade, the roof must have light thatching of ooloo grass, or creepers must be allowed to grow over it. Most of these birds like retirement, and opportunities should be given them to enjoy it. Clumps of reed, grass, and shrubs should be planted, but if the place is small and the birds are many, there is little chance of anything growing; small boxes and earthen pitchers, if put up in convenient places, make excellent retiring nests for them. Perches and sticks should be provided for the tree ducks.

Cormorants and snake-birds have to be accommodated elsewhere, as they are generally found to be unfriendly towards the inmates of a duck-house. The experiment of keeping pelicans and swans loose in a large lake was tried, but failed, owing chiefly to the depredations caused by crocodiles in the water and jackals on land. This was unfortunate, as the large island in the middle of the lake, thickly overgrown with trees and shrubs, was all that a swan could desire as a breeding-ground. Besides those mentioned above, there are also other disadvantages in keeping aquatic birds loose in a large tank: unless their number is considerable they become lost; then there are birds which cannot be pinioned; these have to be periodically clipped—an operation which not only involves much trouble, especially when there are many, but causes fright and unrest in the whole colony; then, again, the pelicans will soon clear a tank of its fish. A simple enclosure like that used for keeping the swans, &c., is, however, no safety against jackals and other predatory animals at night, so that they have to be driven in every evening to a shed. This is not a desirable arrangement, as the operation is not only attended with trouble to the keeper, but sometimes with great discomfort to the animals.

Food.—Cormorants, snake-birds, and pelicans live upon fish; in captivity the latter readily take to eat meat also, but too exclusive a meat-diet is injurious to their health. Although they can, and do,

eat more whenever they have an opportunity, quarter to half a seer of fish each daily is enough for cormorants and snake-birds; it is incredible what large sized fish they are capable of swallowing; snake-birds have been noticed to eat fish over four inches broad. At the scale of feeding indicated above, each bird costs from Rs. 3 to Rs. 4 per month. When they have facilities for fishing for themselves, no fish need be supplied to the pelicans, but some beef meat ($\frac{3}{4}$ to 1 seer) should be allowed; they are greedy birds and soon clear a tank of its fish. The kinds of fish mostly used for feeding animals are *coi* (*Anabas scandens*, *Dald.*) and *singhee* (*Saccobranchus fossilis*, *Bloch.*) The food of swans, ducks and geese consists of grains, vegetables, and grass, supplemented a good deal by aquatic insects, worms, larvæ, &c. Of grains, paddy and bran are chiefly used here, but Indian-corn, bajra, and rice may be substituted for or mixed with them. None should, however, be given dry, but moistened with water. Swans and some of the ducks and geese graze much, audibly tearing the grass with their sharp beak, and an extensive grassy bank is therefore of great advantage. They are all more or less fond of tender shoots of aquatic plants, and soon clear a pond of its herbage, and hence it is difficult to grow anything in a small covered enclosure: *toka panu* (*Pistia stratiotes*), baskets full of which are now and then supplied, is greedily devoured. Wherever practicable, *kalmi* (*Convolvulus reptans*) and other aquatic plants should be grown. The swans, ducks and geese may constantly be seen dabbling about near the bank and in shallow water in search of live food, such as worms, larvæ of aquatic insects, and fresh-water crustaceans. It is asserted that swans never feed on animal food. This does not appear to be absolutely correct. Their staple food, no doubt, consists of vegetables and grains, but it has been observed that they do not despise crustacean diet.

Transport.—For the transport of exclusively fish-eating birds, such as cormorants and snake-birds, over long distances, somewhat similar provision for fish should be made as recommended under the otter (page 91); fresh fish may also be bought at several ports of call. Some cormorants become readily accustomed to eat mince meat if combined with fish: for the swans, geese, and ducks a quantity of grit should be provided.

Breeding.—A pair of spotted-bill ducks bred in the latter end of 1885; no nest was made, but the eggs laid on a thick bed of down in one of the retiring boxes overhanging water. Swans would breed in this climate if suitably lodged; one of those living in the Royal Botanical Gardens, Sibpur, near Calcutta, laid four eggs in May 1890, all of which were unfortunately broken. The chief impediments to swans breeding are the presence of other birds, some of which are destructive to eggs; the necessity of driving them in every night for safety, causing a certain amount of disturbance among them; and want of seclusion.

TREATMENT IN SICKNESS.

Thread worms, such as those commonly met with in fish, have been found in the stomach and intestines of a large cormorant. *Invagination* of the intestines has been known to cause the death of a snake-bird. *Fungoid growths* in the gullets of several species of ducks have been met with. These cases chiefly occurred when they were kept in an artificial

condition in cages with brick floorings and masonry tanks. *Tuberculosis* of the lungs and liver is not uncommon among various species of aquatic birds. *Leprosy* of the liver has been met with in spotted bill and pink-headed ducks. *Disease of oil glands* has often been noticed in new arrivals; the birds neglect preening, and their feathers get wet, resulting, not unfrequently, in cold, rheumatism, and other ailments; dirt, confinement, and overcrowding during transit usually cause this disease. The gland should be gently washed with tepid water and dirt sticking about the place removed, and until its action is established, the patient should not be exposed to wet: it is also brought on by general debility and organic disorders.

OBSERVATIONS ON THEIR HABITS.

Cormorants are never shy; when sitting on a perch or on the ground they generally keep their wings slightly expanded. This habit is more noticeable in the little cormorant than in the larger species. They dive for fish and hunt it under water, and such is the force of habit that, when a fish is thrown on the floor, the cormorant picks up one, immediately betakes to water, and after having swum and dived for a few seconds, comes ashore to eat it. The snake-birds have almost identical habits with the cormorants; those in this garden seem to be very retiring.

The same set of pelicans have been observed to resort to a particular tank immediately after the first shower of monsoon rain, and having enjoyed fishing for five or six days, to desert it until about the same time the next year; they never dive, but when hunting for fish frequently plunge their beak deep into the water, the tail raised perpendicularly above its surface; it would remain in this position struggling to find something for ten to fifteen seconds; they actively engage themselves in hunting for food after the sun has gone down in the evening, sometimes continuing the operation at night, particularly if there is moonlight; they fish at other times also, especially in the morning, but not so regularly. When regularly fed at a particular spot, they congregate there at the approach of the feeding time and show their eagerness and impatience for food by frequently opening their mandibles in imitation of the action of receiving food into the pouch. The delicate flapping movement of their extensile pouch is most visible while they are resting during the middle of the day. Swans are very cleanly in habits, and spend much time and attention in cleaning their feathers every morning after breakfast; some may be seen on shore assiduously engaged in preening, others in water-washing themselves, passing the beak over every part of the body, and now and then beating the water with both wings to splash it over every part. Their toilet finished, some repair again to the feeding vessel to finish its contents, others retire for a nap or for a quiet sail. The swans gather together in the shade during the midday heat of the summer, and remain quietly floated for hours, as if afraid to venture out in the sun. Swans are not unfrequently seen to fall sound asleep while floating on the water and to drift along at the mercy of the breeze. Extremely graceful in the water, a swan is very awkward and clumsy in its movements on land; it feels relief on nearing the water; and

when coming down a sloping bank, and about to reach its proper element it is often observed to push itself forward on the breast. A swan is seen at its best when, with wings and tail raised and feathers erect, it majestically pursues a female. This, however, should not be confounded with the ruffling of feathers caused by anger or fright. It has several other movements, each expressive of a particular state of mind. Like pelicans, the swan also plunges its neck deep into the water where it is shallow with a view to extract something eatable from the mud at the bottom. Another characteristic peculiarity of the swan is that it may be seen swimming leisurely with one leg drawn backward and upward, so as to be distinctly visible above water. At the approach of the migratory season, which commences at the termination of the cold weather, the ducks and geese evince great restlessness, and if loose and capable of flight disappear. Ducks which in their wild state do not roost on trees have been known to acquire the habit of a tree-duck in captivity. Widgeons, white-eyed and mandarin ducks living in a large aviary with other species of birds regularly roost on perches provided for other birds. The seasonal change of plumage is noticeable in some ducks, but it is most conspicuous in the mandarin; it begins throwing off its feathers about the latter end of May, and by the first week of July the casting off of the old feathers is complete. It remains in this condition for about a fortnight, and after that period gradually begins to assume a new plumage, completing the change about the middle of September. In one or two cases the growth of new feathers has been noticed to become arrested in its progress, the moult remaining incomplete until after the next season. For detailed information with regard to the habits of ducks and geese which visit India and the adjoining countries, Hume and Marshall's "Game Birds of India, &c.," may be consulted.

(314) THE PAINTED SAND GROUSE.

(PETROCLES FASCIATUS—(Scop.))

Hindi—*Hunderi*, *Boat-bur*, *Bhut-titur*.

Hab.—Greater part of India, except Lower Bengal.

(315) PALLAS'S SAND GROUSE.

(SYRRHAPTES PARADOXUS—(Pall.))

The characteristic feature of this genus consists in its remarkably small feet, which are joined together at the base and feathered to the claws.

Hab.—Deserts of Central Asia, North-West China.

LENGTH OF LIFE IN CAPTIVITY.

Of a dozen specimens obtained in the latter end of 1888, only one is now alive.

(316) THE THIBETAN SAND GROUSE.

(SYRRHAPTES TIBETANUS—(*Gould.*))

Description.—"It has the upper parts and breast minutely mottled with zigzag markings; the throat and sides of the neck ochre yellow; the wings sandy yellow with some black markings on the scapulars; and the lower parts white. Length 20 inches."

For a detailed description of the species see Hume and Marshall's "Game Birds of India, Burmah, and Ceylon."

Hab.—Within India, the desert Alpine tracts of Ladak and the upper portions of the Sutlej Valley; beyond it, the high plateaux north of the Himalayas.

LENGTH OF LIFE IN CAPTIVITY.

The same as the preceding species.

(317) THE LITTLE BUTTON QUAIL.

(TURNIX DUSSUMIERI—(*Temm.*))

Hindi—*Dubki*, *Turra*. Bengali—*Libbia* in Purneah.

Hab.—Widely distributed in India, but not very common in Lower Bengal. In Bengal specimens have been obtained from Jessore, Purneah, Bhagulpore, Nya Dumka, &c.

TREATMENT IN HEALTH.

Housing.—In providing accommodation for the sand grouse, damp and wet should be scrupulously avoided, and may be generally treated like the houbara bustard.

Food.—Grains, seeds, fruits, and berries; a liberal allowance of vegetables should be supplied. Insects and worms are also acceptable to them.

Transport.—The sand grouse are extremely shy birds, and should be treated almost like pheasants.

TREATMENT IN SICKNESS.

An autopsy was performed in almost every case after the death of a Pallas's or Thibetan sand grouse, and in the majority of them death was found to have been caused by disorders of the *liver* or *lungs*.

OBSERVATIONS ON THE HABITS OF SAND GROUSE.

They are extremely timid birds, and as shy after six months as on their arrival; although the cage in which they lived was lofty and spacious, they were seldom, if ever, observed to fly, always preferring to squat on the sand and hay on the floor; they are said to be rather noisy birds in their wild state; in captivity, however, they are not so.

(318) THE SARAS CRANE.

(GRUS ANTIGONE—*Linn.*)Hindi and Bengali—*Saras*.

It is a well-known bird, and therefore no description is necessary.

Hab.—India and Burmah; not common in Lower Bengal. For a detailed account of its distribution see Hume and Marshall's "Game Birds of India, &c."

LENGTH OF LIFE IN CAPTIVITY.

Saras cranes are generally hardy and live for years; the nestling and yearling birds which are frequently brought for sale, are, however, sometimes difficult to rear.

(319) THE COMMON CRANE.

(GRUS COMMUNIS—*Bechst.*)Hindi—*Kulung*.

Description.—The prevailing colour of the plumage dark ashy, washed with faint bluish; forehead black; crown red; sides of the head and neck white. In most specimens the white has a reddish or buffy tinge; tertiaries elongated, floating and black tipped. The colour of the bill varies a good deal in shade in different individuals; it is usually dingy horny green; the colour of the irides also varies; legs black.

Hab.—Found throughout Europe, extending to Northern Africa, Palestine, Asia Minor, Persia, Afghanistan, Siberia, and China. In India it is a winter visitant only, being more common in the north than towards the east; there is no record of its ever being found in Lower Bengal.

LENGTH OF LIFE IN CAPTIVITY.

The longest period during which any of these birds has as yet lived here has been three years and a few months only.

(320) THE AUSTRALIAN CRANE.

(GRUS AUSTRALASIANA—*Gould*.)

It resembles the saras crane, but is somewhat smaller. and the extent of the red, which is lighter and of a buffy tinge, limited.

Hab.—Australia.

LENGTH OF LIFE IN CAPTIVITY

Four years.

(321) THE LARGE WHITE, OR THE SNOW-WREATH CRANE.

(GRUS LEUCOGERANUS—*Pall.*)Hindi—*Care-Kur*. *Tunhi* in Oudh.

Except the quills, which are black, the whole plumage is white ; the naked skin of the face red ; legs and feet red ; the red is duller in immature specimens, and very intense and bright in adult during the breeding season.

Hab.—Afghanistan, Eastern Turkestan, various parts of Siberia. Mongolia, Manchuria, and Japan, and rarely North China ; it visits India as a winter migrant, and is generally confined to several districts of the North-Western Provinces, and to the lakes and rivers of the Himalayas.

LENGTH OF LIFE IN CAPTIVITY.

Specimens have been living since 1882.

(322) THE WHITE-NECKED CRANE.

(GRUS LEUCAUCHEN—*Temm.*)

Of a brownish slaty grey colour ; the head and the upper part of the neck white.

Hab.—Japan.

LENGTH OF LIFE IN CAPTIVITY.

Two years and six months ; the death was caused by some accident.

(323) THE MANCHURIAN CRANE.

(GRUS VIRIDIROSTRIS—*Vieill.*)

It resembles the kulung or common crane, but differs from it in having a green bill and black legs ; in immature specimens the green of the bill is dull.

Hab.—North China.

LENGTH OF LIFE IN CAPTIVITY.

Nearly three years ; the specimens exhibited never assumed proper plumage or looked happy.

(324) THE DEMOISELLE CRANE.

(GRUS VIRGO—*Linn.*)Hindi—*Karkarra*.

Description.—Head, neck, and elongated plumes of the breast black ; a tuft of white feathers extend backwards from each eye ; the general

plumage ashy grey; quills black; the tertiaries elongated and drooping; bill greenish at the base, yellowish in the middle, and pinkish at the tip (the latter is not always very distinct); irides coral red.

Hab.—Southern and South-Eastern Europe, Northern Africa, Asia Minor, countries about the Caspian, Eastern Turkestan, Afghanistan, Southern and North Eastern Siberia, Dauria, Mongolia, and Western China. It is a cold weather visitant to India, and is found during the winter in the western parts of Southern India, Central Provinces, the North-West Provinces, Behar, in the sub-montane districts of Bengal and Assam.

LENGTH OF LIFE IN CAPTIVITY.

It bears captivity remarkably well, as some of them have been living for a number of years.

(325) THE BALEARIC CRANE.

(*BALEARICA PAVONINA*—(*Linn.*))

Description.—Forehead velvety black; crown of the head adorned with a large tuft of wire-like bristles of variegated colour; general colour of the upper plumage, including the hackle-like plumes, ashy grey; chin black; beneath and behind the eye a large bare red patch; the exposed parts of the wings white, the inner red; some reddish brown loose plumes cover the lower parts of the wing; under surface grey.

Hab.—West Africa.

LENGTH OF LIFE IN CAPTIVITY.

Specimen living since 1883.

(326) THE CAPE CROWNED CRANE.

(*BALEARICA CHRYSOPELARGUS*—(*Licht.*))

In this species the bare patch beneath and behind the eye is white.

Hab.—West Africa.

TREATMENT IN HEALTH.

Housing.—Properly speaking, cranes require no housing; they enjoy nothing better than being kept loose in a garden, with freedom to roam about as they like; but this mode of keeping does not answer in a public garden where hundreds of visitors daily resort. The next best accommodation for them is a large enclosure with a tank, so that they may have ready access to water. The crowned cranes have been found doing well in enclosures without a tank: the saras, snow-wreath, and the demoiselle cranes require no particular protection from rain, while the success which has hitherto attended the keeping of the crowned cranes is mainly due to the scrupulous care with which they have been

protected from the vicissitudes of the climate. Saras cranes are much given to fighting among themselves and with others, and care should be taken to isolate the ill-tempered ones. Jackals and other larger predatory animals are great enemies of animals that cannot defend themselves, and the smaller cranes are among them; hence the necessity of shutting them in every night.

Food.—Cranes are usually fed on grains of various kinds, soaked or dry, according to individual taste, and vegetables; but some of them find a great deal of their own food, consisting of frogs, lizards, small reptiles, fresh-water shells, earth-worms, &c. This shows the kind of accommodation they must have. The white and the crowned cranes do not appear to care much for this kind of diet.

Transport.—Half a dozen or more saras or other cranes are frequently brought down to Calcutta from Lucknow and other up-country stations in wicker cages, all being hooded with a piece of cloth to prevent their pecking at each other. The birds suffer much, as they can neither eat nor drink properly during the time the journey lasts. Demoiselle cranes are not much given to pecking at each other or anybody, and therefore seldom require hooding. When they are to be sent to far countries and the journey to last for a considerable time over the sea, no wicker arrangement will do, but a light strong plank cage of suitable size should be provided; the front must be made of wire netting to prevent the birds putting out their beaks, and a screen provided for letting down in bad weather; unless they have lived peacefully for some time and their temper is well known, saras and white cranes should not be placed in pairs, but all separately.

Nothing particular is known about their ailments in captivity.

OBSERVATIONS ON THE HABITS OF CRANES.

A saras crane is fond of living in the neighbourhood of water, and so are the demoiselle, snow-wreath, and the Australian cranes; it is never shy, timid, or suspicious, but soon becomes tame and confiding, so that it readily comes to the side of the enclosure to be fed and caressed, not unfrequently evincing great pleasure at the notice taken of it by performing many amusing antics with outstretched wings and accompanied by a low, subdued trumpeting; its purring is also expressive of pleasure. A saras of a bad disposition is, however, not uncommon; it appears to exist only, as it were, for pecking at everything, bird, beast, and man; children being the special object of its wrath. It usually feeds during the day, but on several occasions it has been observed to be engaged in stirring up the mud and searching for food till late at night. The trumpeting of a saras is loud and piercing and may be heard at long distances; it is heard oftener at night and early in the morning; and when they are living in batches in different parts of the garden, the call of one is always answered by the others. Whether they habitually kill snakes is not known, but on one occasion two of them were observed doing so. The white or snow-wreath crane is more shy and generally less noisy, though at the breeding season it may be heard calling loud and sometimes incessantly with much display of plumage; compared with the saras its note is feeble, but not so feeble as it has been represented to be by some authorities; the note is a shrill, shivering whistle

with a mellow weirdness about it; the white crane appears to be fonder of water than the saras or any other crane. The common, Manchurian and Japanese white cranes have not thriven well here, and have generally behaved in a listless way. The dance of the demoiselle cranes at the commencement of the breeding season is well worth observing; it has been graphically described by Von Nordmann, and quoted by Hume and Marshall in "Game Birds of India, &c." "They dance and jump," Von Nordmann says, "towards each other, bowing themselves in a most burlesque manner, bending their necks forward, extending the plumes on the neck and depressing their wings; others again in the meanwhile run races, and on arrival at the goal return striding along gravely and quietly, whilst the rest of the assembly greet them with reiterated cries, inclinations of the head, and other demonstrations." It appears that this dance depends a great deal upon the number of birds living together. With occasional interruptions, a few of these birds have always been living in the garden ever since its establishment, but they were never noticed to dance before. It was in the spring of 1891 that they were for the first time observed to indulge in this habit, their number having previously been augmented by the accession of a good many new specimens. During the season of migration they become inordinately restless, calling incessantly and making repeated ineffectual attempts at flight; they are always lively and active in the forenoon, but generally quieter in the afternoon. The specimen of the belearic crane living in the garden is a most amusing creature; but it has its moods: grave or gay, pugnacious or amiable; it has two distinct call notes, uttered in succession; and mostly heard while shut up in its house.

(327) THE INDIAN HOUBARA BUSTARD.

(HOUBARA MACQUEENI—*J. E. Gray & Hardw.*)

Description.—Head crested; the crest is composed of a series of lengthened slender feathers in the centre of the crown; those in front white with black tips, those behind wholly white; upper plumage pale buff and beautifully mottled; terminal half of the primaries black; cheeks white, with black shafts and tips; the throat white; neck delicate fulvous; under parts white; the neck ruff begins from near the ear coverts; those at the sides of the neck are very long, white at the base and black at the tip; bill horny or horny slate colour; irides pale to bright yellow; legs and feet pale yellow. Total length from 25 to 27 inches.

Hab.—The plains of the Punjab, Rajputana, Northern Guzerat, Cutch, the northern parts of Kattywar and Sindh; stragglers may sometimes be found in other places in North-West India during the cold weather; common and abundant in the desert tracts of Bikaner, Jodhpore, and adjacent tracts. They are cold weather visitants to India, and are found throughout the year in Afghanistan and Persia.

LENGTH OF LIFE IN CAPTIVITY.

Specimens have been living since April 1890.

(328) THE BENGAL FLORICAN.

(SYMPHEOTES BENGALENSIS—*P. L. S. Müller.*)

A specimen obtained some years ago lived for a few days only; another has recently been obtained, and is so far doing well.

TREATMENT IN HEALTH.

Housing.—The only way to make the damp, moist climate of Lower Bengal tolerable to a bustard is to give it a high and dry place to live in, with a run of suitable dimension attached to the cage; the latter should be turfed and planted here and there with shrubs to afford it concealment when alarmed; it is an extremely timid bird, and impatient of intrusion, exhibiting much fright and restlessness at the slightest cause of excitement. Until such time as it gets over this state of mind, it should either be placed in an unfrequented part of a garden, or such precautions taken as to prevent its remaining in a constant state of excitement and unrest; canvas screens may be kept down, or a light hand-railing placed round the cage to prevent visitors approaching too near. A place similar to that assigned to the swans, pelicans, &c., is no doubt the best for the Bengal florican, which frequents swamps and jheels; failing this it, may be accommodated with the bustard.

Food.—In its wild state the bustard feeds on fruits, berries, shoots of grass, picking up grasshoppers and beetles; in captivity the same kind of food may be easily supplied. Specimens now living in the collection were habituated to feed on bread and milk, and on being offered fruits and grains took no notice of either. They are, however, being gradually weaned from a bread and milk diet; if the run is large, patches of paddy, wheat, Indian-corn, mustard, and lemon grass may be planted in proper seasons: while the unripe ears of corn and tender shoots of grass will supply them with a good deal of natural food, the plants will afford them cover and amusement. The florican feeds on seeds, grass, and insects.

Transport.—Should be treated like the pheasants.

OBSERVATIONS ON THE HABITS OF HOUBARA.

The species has only been lately obtained, and has not yet become thoroughly accustomed to its new surroundings. It behaves much like a partridge in walking up and down the sides of the cage, and dashing against the wire when alarmed.

(329) THE PURPLE COOT.

(PORPHYRIO POLIOCEPHALUS—(*Lath.*))Hindi—*Keim Kaim*. Bengali—*Kæm Kem*.

Hab.—Found throughout India and Ceylon, and is common in Bengal wherever there are extensive marshes and jheels.

LENGTH OF LIFE IN CAPTIVITY.

As the specimens have got mixed up, it is difficult to determine the individual identity; it is, however, not unlikely that some have been living for the last twelve years or even more.

TREATMENT IN HEALTH.

Housing.—Being aggressive and quarrelsome in habits, it cannot unfortunately, be kept with the ducks and other smaller aquatic birds, and is consequently accommodated in less suitable places. Wherever placed, it should have abundant supply of reeds, tank-weeds, and other plants growing in water, as the stems not only afford it food, but it delights to walk and perch on them. It soon becomes tame, and may then be kept loose in tanks and jheels.

Food.—Seeds, grains, and vegetables. Those living in the garden appear to be omnivorous. Minced meat, bits of bread, and other remnants of food are as welcome to them as grain and seed.

Breeding.—The purple coots have thrice bred in this garden, each time the hen laying four eggs: they have been known to have two broods in a year. Early in June 1890 a pair had two chicks, which were unfortunately killed by some vermin before they were many days old; the pair concerned were, however, determined to have young ones, so that, after an interval of about a fortnight fresh eggs were laid, and in due time hatched. Proper precautions having this time been taken, they succeeded in rearing the young, which are now full-grown birds. Although the male was frequently near the female during the process of incubation, it was never noticed to take any share in the act. For about two months after the young are hatched, the parents exhibit great solicitude and concern in their safety and well-being, so that, if anything unusual occurs, the hen bird at once runs towards the chicks and sits crouching with wings stretched over them, while the cock assumes an attitude of anger and defiance towards the intruders; often has a coot been observed to stand against the wire-netting, and watch every movement of a domestic fowl just outside it, of whose presence it would take no notice under ordinary circumstances. They have also been repeatedly observed to fly in a rage with outstretched wings towards a new keeper and to peck and kick him with vicious energy. The eggs are faint bluish grey and spotted brown. The young coots take about six months to assume perfect plumage.

OBSERVATIONS ON THE HABITS OF COOTS.

The coots destroy eggs by sucking them, and have been known to treat even their own eggs in this way. They fight among themselves with energy and force, and when thus engaged they sometimes get interlocked.

(330) BLYTH'S COOT.

(PORPHYRIO CHLORONOTUS—*Blyth*.)

Hab.—Africa. The specimen was caught 50 miles off Cape Verde.

LENGTH OF LIFE IN THE GARDEN.

About three years.

(331) THE COOT.

(FULICA ATRA—*Linn.*)

Hindi—*Dasarni*. Bengali—*Burra Godhan*, about Purneah.

Description.—The entire plumage black, deep about the head and neck, greyish on the back, and ashy below; bill and frontal disk white, the former slightly tinged with pink or rosy during the breeding season; in young birds the frontal disk is inconspicuous; irides red; feet greenish.

Hab.—Europe, Asia, and Africa; common in most parts of India.

LENGTH OF LIFE IN CAPTIVITY.

The same remarks as have been made with regard to the purple coots apply to these also.

(332) THE WATER COCK.

(GALLICREX CINEREUS—(*Gmel.*))

Hindi and Bengali—*Kora* or *Khora*.

It resembles the purple coot in general appearance; but the prevailing colour of its plumage is dull black instead of bluish; the male has a long flesh-red crest.

Hab.—India, Burmah, Ceylon, and Malayana; common in Lower Bengal. Specimens have been obtained from Dacca and Tipperah.

LENGTH OF LIFE IN CAPTIVITY.

About seven years.

(333) THE MOOR HEN.

(GALLINULA CHLOROPUS—(*Linn.*))

Hindi—*Jat Murghi*. Bengali—*Dahuk Paira*.

Hab.—Found throughout India.

LENGTH OF LIFE IN CAPTIVITY.

No record.

(334) THE WHITE-BREASTED WATER HEN.

(ERYTHRA PHÆNICURA—(*Penn.*))

Hindi and Bengali—*Dahuk*.

Hab.—India, Burmah, Ceylon, and the Malayan Islands; it is very common in Lower Bengal, and numbers of them are found in a wild state within the garden.

LENGTH OF LIFE IN CAPTIVITY.

No record of individual specimens has been kept, but the species bears captivity well.

TREATMENT IN HEALTH.

Housing and feeding.—The coots and water hens may be treated like the purple coot. With the exception of the water cock, they are all good tempered and sociable and do well with the ducks; the water hens live happily in a large aviary. They mostly feed on vegetables; but almost everything supplied to other birds is welcome to them, minced meat and maggots not excepted.

Breeding.—The white-breasted water hens breed regularly within the garden, building their nests of weeds in the midst of shrubberies near the edge of the tank; in tanks full of weeds they have often been found to build right in the middle.

OBSERVATIONS ON THE HABITS OF COOTS AND WATER HENS.

The coot is most aquatic in habits, swimming and diving like a duck; the water cock has similar habits to that of the purple coot, but it is shy and retiring in disposition; though not generally aggressive, when provoked it fights savagely; it has a peculiar deep trumpet-like voice; the water hen is very tame and sociable; the jerky movement of its tail is very noticeable, especially when it is excited. They are rather noisy birds, particularly during the breeding season; those living in the aviary always roost on the topmost perches.

(335) HARDWICKE'S SPUR FOWL.

(*GALLOPERDIX LUNULATA*—(*Valenc.*))

The spur of the hen bird is small, and there is generally only one in each leg.

Hab.—Several parts of Southern India, including the Eastern Ghâts, Hyderabad in the Deccan, and extending through Central Provinces to Mirzapore and Monghyr.

There is no record of the period during which any of them lived in this garden.

(336) THE BLACK FRANCOLIN.

(*FRANCOLINUS VULGARIS*—*Steph.*)

Hindi—*Kala titur. Ghaghar.*

Hab.—Throughout the whole of Northern India, from the Himalayas to the valley of the Ganges; Cuttack, Midnapore, Maldah, Dinajpore, Rungpore, Dacca, Tipperah, Sylhet, Cachar, Manipur, the Garo and Khasia Hills, Bhutan Duars. Outside India it is found in Southern Beluchistan, Afghanistan, Southern Persia, and the forest regions of the Caspian.

LENGTH OF LIFE IN CAPTIVITY.

The black francolin does well in captivity in Lower Bengal; specimens have lived for upwards of ten years.

(337) THE PAINTED FRANCOLIN.

(FRANCOLINUS PICTUS—*Jerd. et Selb.*)

Hab.—Central and Southern India, Saugor and Nerbudda districts, Cuttack, and Nagpore.

LENGTH OF LIFE IN CAPTIVITY.

The same as the black francolin.

(338) THE GREY FRANCOLIN.

(FRANCOLINUS PONTICERIANUS—(*Gmel.*))

Hab.—Central India.

(339) THE WOOD FRANCOLIN.

(FRANCOLINUS GULARIS—(*Shaw.*))

Hab.—Eastern Bengal.

(340) THE HILL FRANCOLIN.

(ARBORICOLA TORQUEOLA—(*Val.*))

Hindi—*Ban titur. Peura.*

As this species is not very commonly known in Lower Bengal, a short description is given.

Male—head and ear coverts rusty; the sides of the neck and nape the same colour; lores and supercilia black, the latter lined with a narrow white streak; shoulders, back, and rump olive, with dusky triangular spots, those on the rump being black; chin and throat black, the outer feathers being margined white; the neck and upper part of breast bright olive; below the black of the throat is a circle of white; the lower breast and belly greyish white; sides olive, tinged with chestnut and marked with large white spots; tail black speckled, with a terminal dark band; bill black; irides brown; legs red; total length about $10\frac{1}{2}$ to 11 inches. The female differs from the male in having the head and neck olive or olivaceous with black speckles, and the chin, throat, and sides of the neck light chestnut, with black markings; the neck and the breast olive with a chestnut gorget.

The shoulder, back, rump, and sides of the specimens in the garden are light ashy.

Hab.—Found in the Himalayas from Simla to Sikkim, at elevations from 5,000 to 9,000 feet; it also occurs in Assam.

LENGTH OF LIFE IN CAPTIVITY.

Specimens have lived upwards of six years; appear to bear captivity well in Lower Bengal.

(341) THE WESTERN BAMBOO-PARTRIDGE.

(BAMBUSICOLA FYTCHII—*Anderson.*)

Description.—Head and nape greyish brown; back olivaceous ashy; the feathers of the upper back and scapular with longitudinal chestnut markings; the secondaries and tertiaries have broad chestnut markings and black subterminal spots and whitish tips; quills deep chestnut with black edgings; tail ruddy brown, with ruddy chestnut bands and dark edgings; lores, pale buff, extending beyond the eyes as a supercilium; ear coverts, chin, and throat pale rusty; a broad, black streak extends downward from behind the eye; the feathers of the breast have rufous markings in the centre and paler at the outer edge, and all margined with black, giving a scaly appearance; breast and abdomen buff; sides spotted with black; legs pale grey, with a greenish tinge; bill pale horny black.

Hab.—The Khasia and Garo Hills, North Cachar, and Naga Hills, and throughout the hill ranges of Upper Burmah.

LENGTH OF LIFE IN CAPTIVITY.

It does not appear to thrive well in captivity.

(342) THE BLACK-BREASTED OR THE RAIN QUAIL.

(COTURNIX COROMANDELICA—(*Gmel.*))

Hindi—*Batter.*

Hab.—Found in most parts of India.

(343) THE COMMON QUAIL.

(COTURNIX COMMUNIS—*Bonn.*)

Hindi—*Burra Batter.* Bengali—*Buttree.*

Hab.—Found throughout the most part of India; outside India, it occurs in Beluchistan, Afghanistan, Persia, Arabia, and nearly throughout the whole of Asia

(344) THE ASIATIC QUAIL.

(PERDICULA ASIATICA—(*Lath.*))

Juhar in Western Bengal.

Hab.—Found almost throughout whole India, including Lower Bengal.

LENGTH OF LIFE IN CAPTIVITY.

Although there is no record, quails have generally done well in this garden.

(345) THE CROWNED PARTRIDGE.

(*ROLLULUS CRISTATUS*—(*Gmel.*))

Description.—Head, neck and its sides black; bare area around the eye, and a longitudinal space behind it, red; a red crest of loose plumes on the head; colour of the plumage above greenish; underneath black; wings brown; legs and feet red; basal portion of the bill also red, rest of the bill black. The sexes differ; the female has no crest: the general colour of the plumage grass green.

Hab.—Southern Tenasserim, Malayan peninsula, Sumatra, Borneo, and probably Java.

LENGTH OF LIFE IN CAPTIVITY.

Upwards of seven years.

(346) THE BLACK ROLLULUS.

(*ROLLULUS NIGER*—(*Temm.*))

Description.—Entirely black, with a red crest.

Hab.—Malay peninsula, Sumatra, and Borneo.

(347) THE CALIFORNIAN QUAIL.

(*CALLIPEPLA CALIFORNICA*—(*Shaw.*))

In size it is much larger than any of the quails described above; its head is ornamented with a crest.

Hab.—California.

LENGTH OF LIFE IN CAPTIVITY.

Specimens have lived for over five years.

(348) THE CHUKAR PARTRIDGE.

(*CACCABIS CHUKAR*—(*Gray.*))

Hindi—*Chukor*. Bengali—*Chakor*.

Though well known by name as a bird mentioned in the classical literature of India, its identity is not generally familiar in Bengal.

Description.—General colour of the plumage above pale bluish ashy, washed with rufous; neck and breast ashy, passing into buff in the abdomen; lores black, a slight white band behind the eye; face, chin, and throat light fulvous; a necklace of black band, commencing at the corner of the eye, surrounds the throat; wings reddish; the

coverts and the primaries narrowly edged with buff; sides of the breast and belly banded; the feathers being ashy at the base, black in the middle and tipped brown; bill red; irides buff; legs and feet red; total length varies from 15 to 17 inches. The female resembles the male, but has no spur, and the general colouring of the plumage is somewhat dull.

Two varieties of chukars have commonly been exhibited. Some specimens are dark, with bright red bill and legs; others pale and light coloured. These differences are due (*vide* Hume's "Birds") to the varying conditions of the climate in which they live.

Hab.—Throughout the Himalayas, from the east of Nepal to Afghanistan, and from thence southwards to the level of the sea; the salt range of Punjab. It also occurs beyond the Himalayas, in Chinese Thibet, Southern Mongolia, and the mountainous parts of Northern China.

LENGTH OF LIFE IN CAPTIVITY.

Although specimens have lived for five or six years, they do not as a rule thrive in the climate of Bengal.

(349) THE HIMALAYAN SNOW COCK.

(TETRAOGALLUS HIMALAYENSIS—Gray.)

Hab.—Throughout the Himalayas from the east of Kumaon.

(350) THE THIBETAN SNOW COCK.

(TETRAOGALLUS TIBETANUS—Gould.)

Hab.—The specimen exhibited in the garden was said to have been brought from Almora.

Both the above species were very short-lived in this garden.

TREATMENT IN HEALTH.

Housing.—Wet and damp should be avoided. Though not generally retiring in disposition, these birds all like concealment, and provision should be made that they may enjoy it when they like; small elongated boxes without a bottom placed on the floor, heaps of hay and straw, shrubs in pots may be advantageously used for this purpose; these birds when kept in a large aviary appear to do well; proper accommodation for partridges ought to be of the same style as that recommended for pheasants; new arrivals should not be placed in a house lighted from the sides, but when this is unavoidable, a piece of tarred canvas may be hung up against the wire to prevent the glare.

Food.—Grains and seeds of various kinds, insects, maggots, and vegetables; some of them are fowl feeders, and enjoy stable refuse and filth.

Breeding.—The black and the grey partridges have frequently laid in this garden, without even making any nest.

Transport.—May be generally treated like the pheasants.

TREATMENT IN SICKNESS.

Partridges suffer from almost all the diseases to which pheasants in captivity are subject, and in such cases the same treatment may be tried; climate much affects the chukar partridges, especially during the rains. An apparently healthy and lively bird becomes dull, leaves off feeding, sits listless with feathers blown out, and is found dead the next morning; a *post-mortem* examination shows nothing particular to account for the death. *Abnormal and misshapen growths of beaks and nails* have been met with in partridges, the result, in most cases, of the unnatural conditions in which they are condemned to live in captivity; constant pecking at hard things, and scratching amongst leaves and pebbles in search of food has the natural effect of wearing off the beak and nail in a wild state; while the ease and regularity with which they obtain food in captivity has often an opposite effect. *Tubercular diseases* of the lungs and liver are also common.

OBSERVATIONS ON THE HABITS OF PARTRIDGES.

Partridges are ground birds, though some of them, such as the *F. pictus*, occasionally roost on shrubs or low perches, probably for concealment; the chukar partridge is, however, an exception: it generally roosts high. Most of them keep to the corners of the aviaries, hidden away behind shrubs or underneath the wooden stages for plants, sallying forth every now and then in search of food or for amusement; older birds are bolder and may generally be seen treading the floor of the house in company with other species. New arrivals are very timid, and some of them so stupid that, in spite of opportunity for concealment, they persist in hugging the sides of the cage, close to the wire or a white wall, to the great injury of their breast feathers and head. In aviaries thickly sprinkled with sand or dry earth the tame partridges make hollows by scraping them, and there enjoy dust-baths; they lie on their breasts, leaning now on one side and then on another and exposing the wings alternately—their enjoyment is complete if the place is sunny. The black partridge is very noisy during the spring, which corresponds with its breeding season, and calls loud and incessantly in the morning, at midday, and sometimes even at night; the painted partridge has a pleasant chirping note; the chukar is another noisy bird; its call-note is fully described by Hume. The chukar partridges are more quarrelsome and pugnacious than the other species.

(351) THE HIMALAYAN MONAUL.

(LOPHOPHORUS IMPEYANUS—(Lath.))

Description.—"Male, head with the crest and throat bright metallic green; back of the neck brilliant iridescent purple, passing into bronzy green, and all with a golden gloss; upper part of the back and wing coverts, rump, and upper tail coverts, richly glossed with purple and green, the latter colour prevailing on the wings and furthest tail-coverts, and the purple on the back and rump; middle of the back white; quills black; tail cinnamon rufous; the whole lower surface black,

glossed on the throat with green and purple, dull and unglossed elsewhere."—*Jerdon*. Total length 27 to 28 inches; bill horny grey; naked orbits blue. The female is pale brown with dark spots and markings, and is smaller in size than the male; chin and throat white.

The males lose much of the bright metallic lustre of the plumage after a season in the plains.

Hab.—"From the western borders of Kashmir to the more western portions, at any rate, of Bhutan. The Monaul is found in suitable localities throughout the Himalayas."—*Hume*.

LENGTH OF LIFE IN CAPTIVITY.

A specimen lived for about eighteen months. Others have come into the possession of the garden, but none have thriven; nor is this expected, considering the high elevation at which they live.

(352) SCLATER'S MONAUL.

(LOPHOPHORUS SCLATERI—*Jerdon*.)

This bird has no crest; there is a large bare space all round the eye of a bright blue colour; the sides and back of the neck rich golden copper with a metallic gloss; the middle back, rump, and upper tail coverts white; in other respects it resembles the preceding species generally.

Hab.—Said to inhabit the hills near Sadiya in Upper Assam. A specimen was on deposit for a few months.

(353) THE PHEASANT.

(PHASIANUS COLCHICUS—*Linn.*)

Description.—Head green, brownish on the occiput; behind the ears are small tufts of greenish feathers; throat, sides of face, spot under eye, and neck green, with blue reflexions; upper back golden yellow, feathers with triangular marks of dark blue; rest of the back black, with chestnut margins, and a buffy white streak running parallel to the shaft; rump red with greenish reflexions, deep red over the tail; upper tail coverts olive brown, mottled with brownish black; upper part of the breast rich brown-red, glossing from orange to purple and blue; flank golden orange broadly tipped with deep blue; abdomen black, with centre feathers yellowish brown in the middle, next a red longitudinal line, and a green edging; narrow black bars cross the centre; lateral feathers mottled black on their inner webs; further laterally they are mottled on both webs; under tail coverts deep red; bare skin of the eye scarlet, finely dotted with green feathers. The female is generally smaller, of a greyish yellow colour, and mottled.

Hab.—British Islands.

LENGTH OF LIFE IN CAPTIVITY.

Bears captivity well; some of the specimens lived over seven years.

(354) THE RING-NECKED PHEASANT.

(PHASIANUS TORQUATUS—*Gmel.*)

Description.—Forehead and crown light green; ear tufts and neck deep green with bluish reflexions; collar round the neck white, interrupted in front by the green; upper back brownish red, feathers with black tips and margins; wing coverts buff in the centre, a line of black next, and purplish red at the tip; rump red with green reflexions, some buff marking being visible here and there; shoulders light brown with greenish reflexions; secondaries light brown, having deep chestnut margins; primaries brown, barred irregularly with yellowish white; upper tail coverts red, breast purplish red with rich coppery lustre, the feathers margined with bluish black; flanks golden chestnut, centre of each feather marked with dark blue; abdomen black with greenish reflexions; under tail coverts red; tail very long, yellowish brown, irregularly barred with black, and margined red. The female is brownish, the feathers margined with buff; throat whitish.

Hybrids between this and the preceding species have often been exhibited.

Hab.—China.

LENGTH OF LIFE IN CAPTIVITY.

As hardy as the common pheasants, and live as well.

(355) SCHEMMERRING'S PHEASANT.

(PHASIANUS SCHEMMERRINGI—*Temm.*)

"The male has the whole of the upper surface and throat of a fine coppery brown, with a lighter border to each feather, which in some lights appear of a purple hue; in others rich coppery red, and in others again bright but deep flame colour—this latter being especially conspicuous on the lower part of the back and upper tail coverts * * * *; feathers of the under surface marked like the upper, but the bordering is not luminous, and terminates in dull grey, within which, on the lower part of the sides of the abdomen, is a narrow line of white; eye orbits red; bill brown colour; feet bluish brown colour."—*Gould.*

Hab.—Japan.

LENGTH OF LIFE IN CAPTIVITY.

A male lived for about three years, but it never gained a perfect plumage.

(356) THE BAR-TAILED PHEASANT.

(PHASIANUS REEVESI—*Gray.*)

Description.—"The head is covered by a cowl of white, surrounded by a band of black, with a spot of white under the eye; the neck has

a broad ring of white; the feathers of the back and upper part of the breast are of a brilliant golden yellow, margined with black; those of the lower part of the breast are white, each one presenting bands of black more or less irregular in their arrangement; the under parts of the body are deep black; the tail is formed of eighteen feathers, which are closely folded together, so that the entire tail appears narrow; at the broadest part, the feathers are about two inches in breadth; the ground colour of each tail feather is greyish white in the centre, and golden red at the edges, and crossed with crescent-shaped bars, which vary in number according to the length of the feather, in the longest feather being considerably more than fifty."—*Tegetmeier*.

The irregular bands of black on the lower part of the breast are variable in extent and intensity, so that the breast appears more yellow in some specimens than in others.

Hab.—North China.

LENGTH OF LIFE IN CAPTIVITY.

Of a number of birds exhibited from time to time only one bore captivity well, and lived for about seven years.

(357) ELLIOT'S PHEASANT.

(PHASIANUS ELLIOTI—*Swinh.*)

A specimen of this gorgeously coloured bird lived for about a month only.

Hab.—China.

(358) THE CHEER PHEASANT.

(PHASIANUS WALLICHII—*Hardw.*)

A plain-looking bird of an ashy brown colour, with black and yellowish bars to the feathers; the head crested; bare area round the eye red; total length about 45 inches, of which the tail is about 26; the female is smaller and lighter in colour.

Hab.—The Himalayas, being found in Nepal, Kumaon, Garhwal, Dehra Dun, Kulu, Kangra, &c.

LENGTH OF LIFE IN CAPTIVITY.

Not recorded; it does not appear to bear captivity in the plains.

(359) THE GOLD PHEASANT.

(THAUMALEA PICTA—(*Linn.*))

Description.—In general appearance an adult male is a red and yellow bird with finely variegated feathers. The head is ornamented with a long crest of silky orange coloured feathers. This extends backwards over a tippet formed of broad, flat feathers, which are of a deep

orange colour, with dark blue bars across the tips. These latter form, when the feathers are in position, a series of horizontal lines across the tippet. "Below this tippet on the lower part of the neck the feathers are deep green margined with velvet black; below this again are the scapular feathers of a dark crimson; the back and rump are golden yellow; the tail itself is very long; the two longest central feathers are covered with small irregular circles of light brown on a dark ground, giving them a mottled appearance; the other feathers are barred diagonally with dark brown on a lighter ground. On each side of the base of the tail extend the long narrow upper tail coverts of a bright orange crimson. The wings when closed show the deep blue tertiaries covering the chestnut secondary quills. The upper part of the throat is light brown; the breast and under parts orange scarlet."—*Tegetmeier*. The hens are plain-looking birds, barred with alternate shades of light and dark brown.

(360) AMHERST'S PHEASANT.

(*THAUMALEA AMHERSTIÆ*—(*Leadb.*))

Description.—Forehead green; the long plumes of the crest crimson; tippet white, each feather being margined with a dark green band, with a second narrow band at some distance from the tip; the front of the neck, the breast, shoulders, back and wing coverts, metallic green, each feather being tipped with velvety black; the lower breast and belly white; the thighs and under tail coverts mottled dark brown and white; the tail coverts are brown at the base, striped green and white in the middle, and bright red at the end; the two middle tail feathers are marked with transverse bands of green; the bill pale greenish; the naked skin of the face light blue.

Hybrids between this and the preceding species have also been exhibited.

Hab.—China.

LENGTH OF LIFE IN CAPTIVITY.

Six years.

(361) THE SIAMESE PHEASANT.

(*EUPLOCAMUS PRÆLATUS*—(*Bonap.*))

The general colour of the plumage bluish ashy or bluish grey of a peculiar shade; the feathers of the rump black with crimson margins.

Hab.—Siam and Cochin China.

(362) SWINHÖE'S PHEASANT.

(*EUPLOCAMUS SWINHÖI*—(*Gould.*))

The prevailing colour of the plumage is black, with bluish margins to feathers; longitudinal blue marking at the sides of the neck and upper breast; an elongated patch of white on the hind neck and the

upper back; the portion on the back is lined at the sides and below with a broad lining of bright chestnut with golden and coppery reflexions; there is also a small patch of white on the occiput.

Hab.—Formosa.

LENGTH OF LIFE IN CAPTIVITY.

A male has been living for upwards of five years.

(363) THE RUFOUS-TAILED PHEASANT.

(EUPLOCAMUS ERYTHROPHthalmus—(*Raffles.*))

The general colour of the plumage black of different shades, the rump scarlet, and the tail buff. The female has a dingy greenish plumage, and possesses long spurs like the male.

Hab.—Malacca.

There is no record of the length of life.

(364) VIEILLOT'S FIREBACK.

(EUPLOCAMUS VIEILLOTI—(*Gray.*))

Description.—Crest and general plumage steel blue; feathers of the wings and back margined with brilliant blue; rump bright red; primaries dusky brown; upper tail coverts shining blue; central tail feathers white; remainder black with a bluish gloss; feathers of the flank streaked white at the centre; bare skin of the face deep blue; crest compressed below but expanded at the top; the general colour of the plumage of the female is chocolate brown.

Hab.—Malay peninsula and Sumatra.

LENGTH OF LIFE IN CAPTIVITY.

Specimens lived over five years.

(365) THE BORNEAN FIREBACK.

(EUPLOCAMUS NOBILIS—(*Sclater.*))

Description.—Crest like that of the preceding species and blue-black in colour; neck, upper breast, and back shiny black, with blue and green reflexions; wings brownish black, with greenish margins to the secondaries and tertiaries; primaries and under tail coverts black, with metallic margins; middle of the abdomen and thighs black; tail black with the exception of the four central feathers, which are brownish.

Hab.—Borneo.

A male lived about ten months only.

(366) THE SILVER PHEASANT.

(EUPLOCAMUS NYCTHEMERUS—(Linn.))

Description.—The crest flowing and silky and blue-black in colour; the upper part of the body including the tail white, feathers “pencilled with most delicate tracery of black;” the whole of the under parts bluish black and glossy; the large bare area of the face bright vermilion. The general colour of the female is brown, mottled with grey.

In perfectly healthy birds the bare skin becomes extremely brilliant and somewhat swollen during the breeding season.

Hab.—China.

LENGTH OF LIFE IN CAPTIVITY.

Specimens have been living upwards of ten years.

(367) THE LINEATED KALEEGE.

(EUPLOCAMUS LINEATUS—*Vig.*)

Description.—The whole upper plumage black, closely and finely pencilled with white; on the wings and outer tail feathers the white lines are broader and not so close as on the back; the inner webs of the central tail feathers almost white, traces of markings being visible here and there; the breast and the whole lower plumage black, the sides being streaked with white; the crest black, and the large bare skin of the face red. The female is somewhat smaller and olive brown in colour; the area of the bare skin of the face smaller and less brilliant.

Hab.—Pegu, Tenasserim, &c.

LENGTH OF LIFE IN CAPTIVITY.

About six years.

(368) ANDERSON'S KALEEGE.

(EUPLOCAMUS ANDERSONI—*Elliot.*)

It resembles a silver pheasant in certain points and a lineated in others; the crest is like that of the latter; the marking on the back and tail feathers are much coarser than either of the two preceding species.

Hab.—Burmah.

LENGTH OF LIFE IN CAPTIVITY.

From November 1876 to September 1883.

(369) CUVIER'S KALEEGE.

(EUPLOCAMUS CUVIERI—(Temm.))

Description.—Male—“Like the male of *E. lineatus*, but with no white streaks on the lower plumage; the breast is strongly tinged

with deep blue; a tinge of blue runs through all the upper plumage; and the feathers of the rump and upper tail coverts have broad white margins; the vermiculations on the upper plumage are not so frequent nor so white; and there is much less white on the tail."—*Oates*.

The female also resembles the female of *E. lineatus*, but differs in important points. It is much paler, there are no white streaks on the neck; tail dark chestnut; outer feathers without any marks, the others pencilled black; the lower plumage much duller.

Hab.—Arracan.

There is no record of the period during which any of them lived in the garden, but they are hardy birds and bear captivity well.

(370) THE PURPLE KALEEGE.

(*EUPLOCAMUS HORSFIELDI*—*Gray.*)

Description.—The upper plumage black, the feathers of the wings margined brownish, and those of the rumps and upper tail coverts conspicuously margined with white; the bare orbital skin crimson; the female is rufescent brown, with no white streaks on the lower plumage; the tail black with the exception of the central feathers.

Hab.—Cachar, the Khasia and Garo Hills, extending as far eastward as Sadiya; Bhutan, Sylhet, Hill Tipperah, Northern Chittagong, and probably Arracan also.

No record of length of life in captivity.

(371) THE BLACK-BACKED KALEEGE.

(*EUPLOCAMUS MELANOTIS*—(*Blyth.*))

Description.—Male—"The whole upper plumage, including the crest, glossy black; beneath white; the feathers of the throat and breast long and lanceolate; abdomen, vent, and under tail coverts dull brownish black.

Bill pale horny yellow; orbital skin fine red; irides brown; legs horny. The female has the plumage brown, pale and whitish about the head and throat; the feathers of the back tipped with greyish, and those of the wing coverts and beneath broadly edged with white; all the feathers faintly white shafted."—*Jerdon*.

Hab.—Sikkim, extending as far west as the easternmost parts of Nepal.

(372) THE WHITE-CRESTED KALEEGE.

(*EUPLOCAMUS ALBO-CRISTATUS*—(*Vig.*))

Description.—Crest white; upper plumage bluish black, the feathers being margined with brown; lower back and rump white, feather barred with black; throat and breast greyish white, feathers lanceolate; bill dark, horny; orbital skin bright red; the female is of an uniformly brown plumage, the feathers being tipped with whity brown.

Hab.—North-West Himalayas.

LENGTH OF LIFE IN CAPTIVITY.

Some of these have been living since 1885.

TREATMENT IN HEALTH.

Housing.—In zoological collections pheasants, like most other birds, are exhibited in fixed and permanent aviaries. Once placed in such a habitation they are condemned to live in that limited space till death; they tread the same hard brick floor day after day and year after year, if they live so long; they have no change, cannot forage for themselves, and do not thrive.

A proper pheasantry should consist of a shed or house for shelter and retirement and an open-air flight or enclosure as a grazing ground; to be healthy and comfortable, it should be so constructed as to admit, if possible, of being shifted from one place to another as occasion arises. No bird dislikes more than a pheasant a state of confinement for a lengthened period, within a limited space, as nothing injures its health more than the forced deprivation of all opportunity of grazing for itself. The site selected should be dry and its drainage good, so that even during the rains it ought to be altogether free from subsoil moisture; to ensure this it may be necessary to prepare the ground by raising it with sandy soil. The system of giving the birds an occasional change of ground may be much simplified by building a permanent shed of any desired style and dimensions, and having the runs made of moveable wire hurdles fixed on one side, so that they may be, when required, shifted to the other side of the shed. Small plants and shrubs should be planted in the runs; these afford cover to timid birds which otherwise dash against the wire netting at the slightest alarm. The runs may be netted over at the top with stout fishermen's netting, but to prevent inroads of smaller predatory animals which prowl about everywhere during the night, and even during the day, it is much better to use wire netting; as, however, the pheasants are much given to flying against the top and injuring themselves, a piece of string netting should be stretched across about a foot below the wire. At night the pheasants should be shut in the shed, which ought to be airy and well ventilated during the summer, with contrivances to exclude draughts and cold during the winter. Civets and mungoses appear to have a greater *penchant* for pheasants than for other birds, and are ever on the look-out for the weak points of a pheasantry to effect an entrance; all possible precautions should therefore be taken to keep them out, and the keeper should be instructed and warned to make a close examination of the house every morning, and to have the slightest breach, if any, repaired. During the rains it may be necessary to keep the birds indoors continually for several days, as prolonged exposure to wet in a state of captivity is injurious to their health; the brick floor of the shed should be thickly sprinkled over with coarse sand, which should be occasionally renewed. An aviary for pheasants is wanting in its most essential requisite if it has no grass run. With regard to the change of ground, in permanent aviaries it may be managed by occasionally spreading a layer of fresh earth, about four inches deep, over a portion of the floor of the outer cage. Many valuable suggestions for the formation of aviaries for pheasants may be found in Mr. Tegetmeier's excellent book on pheasants.

Food.—In their wild state pheasants are omnivorous in appetite, feeding on grains, seeds, fruits, tender shoots of plants, vegetables, insects, worms, slugs, and even small lizards; their diet in captivity should, therefore, be as varied as possible, with due regard to the conditions of climate and circumstances affecting animal life. An early meal, consisting of Indian-corn, barley, wheat or other grain, pounded together with a small quantity of egg-shell; green food later on, and grains and seeds and a few grasshoppers or meal worms the last thing in the evening, appear from experience to be as good a dietary for pheasants and other gallinaceous birds in captivity as can be devised. The ingredients must of necessity vary according to the season of the year, appetite of birds, and other conditions. Boiled onions and potatoes, and hard-boiled eggs, shell and all, may be occasionally added. During the rains and winter the latter should be invariably given at least twice a week; fresh green food, and if possible a few fruits and berries, should be daily supplied; if the grass runs be tolerably spacious, a small plot in each may be planted with spinage, salads, lemon-grass, and some succulent vegetables, and this can be easily managed; a wattle hurdle being enough to prevent the birds picking up the seeds and eating the tender shoots as they appear. After they are sufficiently grown, the hurdles can be removed for an hour or two daily to enable the birds to enjoy nibbling at fresh green food. Before, however, the latter is trampled and eaten down, the hurdles should be put up again to allow a fresh crop to grow. Much of course will depend upon careful and intelligent management and constant attention. Pheasants are often fed with *tit bits* by visitors in the afternoon, and if the keeper is observant and careful, he should watch the quantities eaten, and regulate their evening allowance of grains and seeds accordingly. The time for feeding should be very early in the morning and very late in the evening during the winter; and about seven in the morning and five in the afternoon in summer; the green food always between 9 and 10 in the forenoon. A healthy bird takes about 10 to 15 minutes to eat up its food, so that all remnants should be removed after about half an hour; this will have the effect of diminishing the inroads of rats, which are generally attracted by food lying about. A piece of Mirzapore stone, about a foot square, hollowed out so as to leave a rim 1 inch deep, forms a capital feeding vessel. Pheasants should be always fed in one place, and for this purpose the sleeping apartment should be preferred; abundant supply of clean drinking-water should be kept in a cool place, and the drinking vessel daily scoured. Lime in some form or other is most necessary for the pheasants and other gallinaceous birds, and for this purpose plasters of an old building appear to be the best.

Breeding.—The climate of Bengal is generally unfavourable for breeding pheasants, and any aviary unprovided with retiring corners militates against successful breeding. Some pheasants, however, such as the silver, lineated, and Cuvier's (which have bred and reared their young in this garden), breed almost in any climate if properly housed and treated, and a few others may do the same under favourable circumstances. Attention to the following details will be found useful in breeding and rearing pheasants and other gallinaceous birds:—

A proper pheasantry of the type mentioned above, is the first requisite; the pairs should be well matched, and two or more species should

not be exhibited together; there should not be more than three hens to a cock; besides the wicker baskets or nest-boxes full of soft hay or leaves, bundles of faggots or paddy straw may be placed in corners, with a passage just enough to allow the hens to creep in and nestle themselves behind. These places should be searched for eggs, which should be removed immediately after they are laid. In aviaries the hens drop their eggs anywhere, and the male birds frequently destroy and eat them. "There is no doubt," Mr. Tegetmeier says, "but that bad management and improper feeding tend to promote this serious evil. The frequent disturbance of the birds by the inquisitiveness of visitors, bad and improper stimulating food, without a sufficiency of green vegetable diet, want of cleanliness in the pen, an insufficient and dirty supply of water, and want of grit to assist digestion—all aid in developing the habit." The annoyance caused by visitors can be effectually checked in a pheasantry like that described above by simply transferring the breeding pairs to the unoccupied side and closing all access to it. Such a transfer can always be effected without the least disturbance to the birds. Of the various means suggested for preventing the cock bird from breaking the eggs, the following made by Mr. J. F. Dougall, in his "Shooting Simplified," and quoted by Tegetmeier, appears to be simple and practical. "In pheasantries," says he, "means should be taken to prevent the eggs being destroyed by the male bird; and as it is impossible to keep continual watch, the hen should be induced to seek a dark secluded corner by forming for her an artificial nest covered thinly with straw. Under this straw have a net of mesh exactly wide enough to allow the egg to drop through into a box below, filled with soft seeds or shellings, leaving only a few inches between; the cock bird then cannot reach the egg, which falls uninjured on the soft seeds below, and is safely removed." Watching for eggs is perhaps the best and simplest, and is easily managed if the number of birds to deal with is small and the keeper intelligent and careful; a few imitation eggs made of chalk or marble lying about during the laying season may have the desired effect of preventing the cock from acquiring the habit of breaking eggs, or of curing it if acquired. Each hen should not be allowed to sit on more than eight eggs, and it should in no way be disturbed during the period of incubation, or interfered with while rearing its young. The cock should be separated before the eggs are hatched. The chicks should not be fed for about twenty to twenty-four hours after they are hatched; in the meantime some *pupæ* of white-ants should be collected and given them after the lapse of that period; egg beaten with milk and gently heated forms capital food for chicks about this stage; they are found to thrive well on food prepared as follows:—A little mutton fat is set by a gentle heat on an oven, and when sufficiently heated a small quantity of bruised canary, millet and hemp seed, and a little finely chopped green vegetable are thrown in it and rapidly stirred and allowed to cool. The mass crumbles away when cold and is easily picked up by the chicks. Bruised Indian-corn and other equally nutritious grain may be added as they grow older. Other modes of feeding chicks have been recommended in works treating of the subject.

Transport.—Instructions drawn up for the Zoological Society of London by Dr. P. L. Selater and Mr. Bartlett for the benefit of those

desirous of forwarding the various species to England, are reprinted in Mr. Tegetmeier's book on pheasants, and are here transcribed *in extenso* :—

INSTRUCTIONS FOR THE TRANSPORT OF PHEASANTS AND OTHER GALLINACEOUS BIRDS.

1. For exportation, birds bred or reared in captivity should, if possible, be procured. But if this cannot be done, the following rules should be attended to as regards wild caught birds.

2. As soon as the birds are captured, the feathers of one wing and of the tail should be cut off tolerably close to their base. The birds should be placed in a room lighted only from a skylight above and having the floor sprinkled with gravel or sand mixed with tufts of grass and roots and a little earth. Among these the food should be thrown. A tame bird placed with the wild ones is of great advantage, because this bird will induce the new captives to feed. The birds should be kept in this way until they have become tame and are fit to be transferred to the packing case.

3. The food should consist of grain and seeds of various kinds, berries, fruit, insects, green food (such as cabbage, lettuce, &c.), bread or soaked biscuit, chopped meat, boiled eggs, &c.

4. Travelling cages are most conveniently made of an oblong shape divided into compartments about 18 inches square, and not higher than just sufficient to allow the birds to stand upright in them. They should be boarded all round, except in front, where strong wire netting may be employed, although, if the birds are at all wild, wooden bars, close enough to prevent the inmates from escaping between them, are preferable.

5. Every compartment should have the top on the inside padded with canvas, as, if this is not done, the birds are very liable to injure their heads by jumping upwards.

6. A moveable feeding trough should be fixed along the front of each compartment. One-third of this should be lined with tin, pitch, or otherwise made to hold water; the remaining two-thirds will hold the food.

7. Coarse sand or gravel should be kept strewn on the bottom of the cages, and a supply of this should be sent along with the birds, as it is necessary to them for the healthy digestion of their food.

8. The front of the cage should have a piece of coarse canvas to let down as a blind to keep the birds quiet, and in order to give them air, round holes should be bored at the back of the box in the upper part.

9. The box should be cleaned out when the birds are fed, through the opening in front made by removing the feeding trough, care being taken that this opening is not wide enough to let the birds escape.

10. In order to supply the birds with green food during the voyage, a few small trays (the same as are used to hold the sand or gravel) may be sown with seed, such as rape, mustard, or any quick-growing vegetable. The green food thus produced should be cut for them from time to time and the sand and roots afterwards thrown into the cages.

TREATMENT IN SICKNESS.

Cold and catarrh—Is commonly met with among pheasants and other gallinaceous birds, both young and adult; it is mostly induced by exposure to wet and draughts. If detected early, and causes removed, the patient quickly recovers; but if allowed to run on it assumes a purulent form and generally proves fatal: as the purulent catarrh is infectious, the affected bird should be killed, and the place thoroughly washed out and fumigated. A small quantity of raw ginger and a little treacle should be given to the bird suffering from simple cold.

Rheumatism, cramp, and stiffness of joints are also brought about by wet and cold; perfect dryness, warmth and good feeding are the only remedies that can be recommended. These are preventible diseases, and if proper attention be paid to sanitation and hygiene, no trouble need be apprehended from them.

Gape is a most troublesome malady, generally affecting the chickens; it is caused by the presence of a kind of parasite in the trachea of the gallinaceous birds. If not removed and checked early, the parasites multiply immensely and cause death by suffocation. By way of treatment, spirit of turpentine may be applied to the wind-pipe by means of a feather; the spirit of turpentine when properly applied kills the parasites, which are presently expelled in a fit of coughing induced by the application. The parasites may be mechanically removed by a loop of horse hair passed into the trachea. The most successful remedy, however, appears to be the vapour of carbolic acid; its application is easy, and may be managed by placing the afflicted bird in a small wooden box with open top, over which a piece of cloth is stretched, the vapour may be produced by pouring a few drops of carbolic acid on a small earthen gamla, previously made hot for the purpose. Much suffocation will be caused; but this need not be feared, as the bird will recover immediately on being let out in the open air. One application is generally enough to cure the disease. It is recommended by competent authorities that the worms after removal should be burnt, and the dead bodies of the bird affected by them should be similarly treated.

Inflammation of the eyes is also a troublesome complaint, afflicting both young and old birds. It generally breaks out in an epidemic form during the summer and the rains, more especially the former; the orbital area becomes swollen and tumified, and the eyes glued together with a thickened discharge. The patient should be removed from the pheasantry and placed in a clean and roomy cage by itself; the eyes should be washed with tepid water, in which about 5 grains of alum may be dissolved, and having gently wiped them dry with a bit of sponge, a few drops of nitrate of silver (4 grains to an ounce of water) should be applied. This treatment will have to be followed several mornings before recovery takes place. The bird should be fed by hand, otherwise it will die of hunger and thirst: milk and egg treated in the same way as recommended for feeding chicks (p. 334); satoo prepared with finely minced meat; Indian-corn and other nutritious grains crushed and prepared with vegetables; raw ginger and treacle, &c.—should constitute the diet of the birds while suffering from this and similar ailments.

Diarrhœa is not uncommon among pheasants and other gallinaeous birds; too sudden a change in the atmosphere, change of food, bad feeding, exposure and cold may bring it about. If there is much straining, fomentation should be applied to relieve it, otherwise much inflammation of the cloaca and other complications may ensue; internally a few drops of tincture of opium with the milk and egg-food should be given; a little rum in drinking water is also beneficial.

Tuberculosis of the lungs and liver is common, but seldom detected in live birds.

Leprosy tubercles have been found in the livers of gallinaceous birds. Perfectly healthy birds have been found to drop down dead, especially during the summer; too high a condition and adiposity causing the death.

With regard to *housing, feeding, &c.*, the pheasants and other gallinaceous birds to be hereafter described should be similarly treated.

OBSERVATIONS ON THE HABITS OF PHEASANTS.

All pheasants are more or less shy and timid; some of them, such as the silver, lineated, gold, common, and ring-necked pheasants, become soon and easily reconciled to captivity; but others continue as shy as they were on their first introduction. These seldom come out during the day, and prefer roosting under the sloping roof of the house, or in some sheltered nook, concealed from visitors and strangers; they come down to feed and drink, of course, but retire again afterwards. Of those named above, the silver pheasant appears to be the tamest; on the cage being approached, it comes to the side, its musical but soft cooing and look of expectancy betraying nothing but confidence. The display of feathers by the gold, Amherst, and other gorgeously coloured pheasants during courtship is a singularly brilliant sight. The object is the same as in the common peafowl—to captivate the female.

(373) THE RED JUNGLE FOWL.

(*GALLUS FERRUGINEUS—Gmel.*)

Hab.—"Jungly districts of all Northern India, from the valleys of the Sub-Himalayan region southward to the Vindhian range and the North Circars; Assam, Burmese and Malay countries; Turkestan? (Blyth); Terai jungles of Oudh (Irby), Lombock; Timor (Wall.)—" *Elliot.*

This bird is the origin of our domestic fowls.

(374) LAFAYETTE'S JUNGLE FOWL.

(*GALLUS LAFAYETTII—Less.*)

Hab.—Ceylon.

It differs from the above species in having a yellow comb.

(375) SONNERAT'S JUNGLE FOWL.

(GALLUS SONNERATI—*Temm.*)*Hab.*—Southern India, extending as far north as the Satpoora hills.

(376) THE FORKED-TAIL JUNGLE FOWL.

(GALLUS VARIUS—*Shaw.*)

It differs from all other species of fowls in having the hackles of the neck square at their tips, instead of lanceolate; another distinctive feature of this species is that it has a single median wattle instead of one on each side. The shade of colour of the bare skin behind the eyes varies.

Hab.—Java and adjacent islands.

(377) THE DOMESTIC FOWL.

(GALLUS DOMESTICUS—*Linn.*)

The following varieties have from time to time been exhibited:—Cotton-feathered breed from China; long-tailed breed from Japan; bantams from China and Japan; Brahma-putra, Cochin, and many other mixed breeds.

Fowls have generally done well. As, however, they do not thrive when confined within a limited space, much care is necessary to protect them from the depredations of mongooses and civets.

(378) THE HORNED TRAGOPAN.

(CERIORNIS SATYRA—(*Linn.*))

Description.—Male—head black; throat intense blue, surrounded by a band of black; neck, upper back, breast, abdomen, and all the under parts bright red, spotted with white, each spot edged with deep black; back, rump, wings, and upper tail coverts brown, variegated with black bars and white eyelets; orbits and erectile horns blue. Female—rufous brown, mottled and blotched with black; breast and under parts generally much lighter than the upper parts, which have a rufous tinge.

Hab.—Nepal, Sikkim.

LENGTH OF LIFE IN CAPTIVITY.

Tragopans have not, as a rule, done well in this garden. The longest period during which one of this species lived has been about eighteen months only.

(379) THE BLACK-HEADED TRAGOPAN.

(CERIORNIS MELANOCEPHALA—*Gray.*)

This species is not so brilliantly coloured as the preceding, owing to there being less red about it.

Hab.—Himalayas, from Gharwal to Kashmir.

LENGTH OF LIFE IN CAPTIVITY.

A specimen lived for about seven months only.

(380) TEMMINCK'S TRAGOPAN.

(CERIORNIS TEMMINCKI—(*Gray.*))

Hab.—Central China.

Only an immature specimen was exhibited.

(381) CABOT'S HORNED TRAGOPAN.

(CERIORNIS CABOTI—*Gould.*)

Description.—Head, nape, and sides of the head black; crest brilliant red; a patch of bright chestnut on each side of the neck; upper parts reddish brown, covered with bright buff spots, which are surrounded with black; the spots are largest on the wings and tail coverts; sides marked with red and black.

Hab.—South-West China.

LENGTH OF LIFE IN CAPTIVITY.

From January 1884 to April 1886.

(382) BLYTH'S TRAGOPAN.

(CERIORNIS BLYTHI—*Jerdon.*)

Description.—Head, neck, and breast bright chestnut; a broad stripe on the top of the head, and a narrow one on each side of the ears black; face and bare skin of the throat rich yellow; a band of green lined by black separates the yellow of the neck from the chestnut of the breast; upper parts reddish brown, covered with white spots; abdomen ashy grey; primaries chestnut; bill black.

Hab.—Upper Assam.

LENGTH OF LIFE IN CAPTIVITY.

More than a year.

TREATMENT IN HEALTH.

Tragopans are very delicate birds to deal with in the plains of Bengal, and it is therefore better not to attempt acquiring the rarer

species, except for the purpose of transport to some other congenial climate. The only chance of keeping any of them alive is to get a perfectly healthy bird, and place it in a cool, airy, and dry part of an enclosure, such as has been recommended for the pheasants generally. Both the summer and rains are trying seasons. The discomfort of the former, however, can be much alleviated by covering the runs with *durmah* and *khus-khus* mats during the middle of the day and until late in the afternoon, and wetting them now and then with water; when kept in houses without runs cold water baths may be administered by a garden syringe.

Food.—The tragopans are more fond of berries and fruits than grain; with respect to animal food, they should be treated like other pheasants.

Transport.—These birds should not be brought down to the plains except during the winter, and if possible newly-captured birds should not be brought down at all. In other respects instructions given in page 335 should be followed.

OBSERVATIONS ON THEIR HABITS.

Climate appears to affect these birds so much that, of a large number of tragopans (*C. Satyra*) exhibited here from time to time, there were a few only that were not always dull. They generally remain perched up almost motionless at the same spot for days and weeks together, coming down at odd times to feed and drink, when there is nobody about. Only one of them has been found to partial advantage displaying its plumage. It was past spring, and the bird had no mate, but in the adjoining division of the same pheasantry was a hen of another species, and to her its gallantry was directed. It was observed perching upon a narrow ledge on the top of a low plank wall, which formed the lower portion of the partition separating the cages; its feathers were ruffled and wings a little expanded, and that on the side farthest from the hen somewhat elevated. In this posture it stood hissing and slightly, but majestically, jerking its head, which, with one eye closed, was bent on one side. Whether from ignorance of the arts of a tragopanian courtship or from wonder at the effect of such a magnificent display, no attention was, at that moment, directed to the horns and lappets, which were probably also erect. For further information about the distribution and habits of this group, Hume and Marshall's "Game Birds of India, &c." vol. I, may be consulted.

(383) THE COMMON PEA FOWL.

(*PAVO CRISTATUS*—*Linn.*)

Hindi—*Mor*, *Tāūs*. Bengali—*Maiur*.

The white and piebald varieties (both imported from Europe) have also been exhibited.

Hab.—Central and South Central India, Trans-Gangetic provinces, the Terai of the Himalayas, Assam; rare in eastern districts of Bengal, but common in Midnapore, West Burdwan, Orissa, and Sambalpore.

(384) THE BURMESE PEAFAWL.

(PAVO MUTICUS—*Linn.*)

This species is readily distinguished from the preceding by the following characters: blue and conspicuous yellow colour of the facial skin; the long and stiff occipital crest, formed of straight, narrow feathers, with the greater portion of the web metallic blue, washed with green; the feathers of the neck, all round, and breast are brown at the bases; next, bronze greenish, assuming different hues in different lights; and lastly, a narrow margin of black. There are other minor points of distinction.

Hab.—Arracan, Pegu, Tenasserim, the northern portions of the Malay peninsula, Siam, and Java.

LENGTH OF LIFE IN CAPTIVITY.

Peafowls are hardy birds, and given suitable habitation, bear captivity extremely well. Some have been living in the garden almost ever since its foundation.

TREATMENT IN HEALTH.

Peafowls are so largely domesticated in India that it would be superfluous to say anything in respect to their *housing* and *feeding*. It may, however, be suggested that for the purpose of exhibiting them in a menagerie, which necessitates a certain amount of restriction to their liberty, a structure similar to that recommended for the bustards, but larger and loftier, and with such modification of details as may be required to accommodate their particular habits, should be provided.

Breeding.—Peafowls in captivity commence laying in spring, and continue, with irregular intervals, almost till the end of the rains.

OBSERVATIONS ON THEIR HABITS.

Peacocks have been observed to commence strutting about, or dancing, as it is popularly called, as early as the middle of December, while they have not yet assumed their full train, and to continue the display until about the end of the rainy season. A peacock dancing about this time looks a veritable guy, with the few shreds of old feathers yet left, but about to fall off. A peacock has been known to manifest a strange attachment to a particular spot, to which it resorts for dancing, which generally takes place in the morning between 7 and 10. This has continued for about four years now. The bird is loose and wanders far and near, but every morning, as long as the dancing season lasts, it may invariably be seen at the same spot, strutting about to the admiration, not of its mate, but of the passers by and the street-boys.

(385) THE PEACOCK-PHEASANT.

(POLYPLECTRON CHINQUES—*Temm.*)*Deo-derrick* of the Assamese.

Hab.—Assam, Sylhet, Cachar, Hill Tipperah, Chittagong, Arracan, Pegu, and Tenasserim, extending to Burmah and Siam.

(386) THE MALAYAN PEACOCK PHEASANT.

(POLYPLECTRON BICALCARATUM—(Linn.))

Hab.—Southern Tenasserim and Malay peninsula.

The males of these birds look like diminutive peacocks, and are adorned with eyelets over the body.

Though generally delicate, they have done tolerably well, some having lived more than seven years.

(387) THE ARGUS PHEASANT.

(ARGUS GIGANTEUS—Temm.)

The secondary quills are much longer than the primaries, and all of them, including the tail feathers, are covered with beautiful eyelets; the general arrangement and design of the colouring is perfect without being gaudy.

Hab.—Southern Tenasserim, Malay peninsula, Sumatra, and Siam.

LENGTH OF LIFE IN CAPTIVITY.

Specimens have lived upwards of ten years.

TREATMENT IN HEALTH.

Much of what has been said regarding the *housing* and *feeding* of other pheasants apply to these also. They appear to be more fond of fruits than other food.

OBSERVATIONS ON THEIR HABITS.

The Argus pheasant is solitary, cleanly, and methodical in habits. It has never been found, even after long years of captivity, to completely overcome shyness and timidity. Its call-note is loud and sonorous, and sometimes heard at night also.

(388) THE DOMESTIC TURKEY.

(MELEAGRIS MEXICANA—Linn.)

Is seldom exhibited.

(389) THE COMMON GUINEA-FOWL.

(NUMIDA MELEAGRIS—(Linn.))

(390) THE MITRED GUINEA-FOWL.

(NUMIDA MITRATA—Pall.)

Hab.—Madagascar.

(391) THE CRESTED GUINEA-FOWL.

(NUMIDA CRISTATA—*Pall.*)*Hab.*—West Africa.

(392) THE VULTURINE GUINEA-FOWL.

(NUMIDA VULTURINA—*Hardw.*)*Hab.*—Eastern Africa.

The Guinea-fowls have not, except the common species, borne captivity at all. The housing was no doubt at fault, and the season of the year was not favourable for acclimatizing them. A habitation similar to that recommended for the bustards will, perhaps, suit them better.

(393) THE GLOBOSE CURASSOW.

(CRAX GLOBICERA—*Linn.*)*Hab.*—Tropical America.

(394) YARRELL'S CURASSOW.

(CRAX CARUNCULATA—*Temm.*)*Hab.*—Tropical America.

(395) THE RASOR-BILLED CURASSOW.

(MITUA TUBEROSA—(*Spir.*))*Hab.*—South America.

The curassows, which are said to be the new world representatives of the pheasants, possess the following characteristics:—

Bill moderate; culmen much curved; tip obtuse; base of mandibles covered by a naked cere; wings short and rounded; tail long and rounded; tarsi stout and long, covered in front by large scales; toes long and scutellated.

LENGTH OF LIFE IN CAPTIVITY.

Curassows thrive well in this climate; some have been living upwards of ten years.

TREATMENT IN HEALTH.

Should be treated like the pheasants.

Curassows are given to fighting among themselves. Their call-note is peculiar, being a combination of the mewing of a cat and the subdued cry of an infant.

(396) THE RUFOUS TINAMOU.

(RHYNCHOTUS RUFESCENS—(Temm.))

Hab.—Brazil.

A specimen lived for a few days only.

(397) THE COMMON CASSOWARY.

(CASUARIUS GALEATUS—(Vieill.))

The distinguishing characteristics of this species are the horny black quill-like spines by which the wings are replaced, and the bright blue and purple colour of the bare skin of the neck; the females appear to have larger *casques*. The largest specimen exhibited stood 4 feet 6 inches high.

Hab.—The Island of Ceram.

LENGTH OF LIFE IN CAPTIVITY.

Three years and a few months. Cassowaries have not hitherto thriven well in this garden, owing partly to unsuitable habitation, and partly also to injudicious feeding.

(398) THE AUSTRALIAN CASSOWARY.

(CASUARIUS AUSTRALIS—Wall.)

It resembles the preceding species in general appearance, but has a larger and more prominent *casque*, and the colour of its naked throat and foreneck is cobalt-blue, the claw on the inner toe is straight and much more elongated than in the Ceram Cassowary, the general colour of the plumage less dark.

Hab.—Australia.

LENGTH OF LIFE IN CAPTIVITY.

Two years and ten months.

(399) THE ONE-WATTLED CASSOWARY.

(CASUARIUS UNIAPPENDICULATUS—Blyth.)

It is distinguished from the above species by its having only one caruncle in the neck; it is of an oblong or elongate oval shape and of a yellow colour; the cheeks and throat are smalt blue; the prevailing colour of the plumage dark brown.

Hab.—The island of Salwatti near New Guinea.

LENGTH OF LIFE IN CAPTIVITY.

About two years.

TREATMENT IN HEALTH.

Housing.—A well-drained grassy lawn with trees here and there to afford shade during the blazing hot days of summer, and a small shed to shelter them in bad weather, are all that is necessary for cassowaries; a light fencing, about 4 feet 6 inches to 5 feet high, is enough to keep them in; stout wire-netting of a somewhat wide mesh had better be used in building the enclosure, as otherwise they are apt to kick and peck through the bars. Their former habitations in this garden having proved unhealthy, they are now accommodated in an enclosure used as paddock for ruminants, and seem to be doing well. In giving them accommodation low damp grounds should be avoided; during the cold winter nights it is better to shut them in.

Food.—Cassowaries thrive on vegetables, fruits, and roots; ignorant dealers feed them on boiled rice and potatoes, and some of the birds take such a fancy to this diet that they refuse any other food offered them. In captivity young birds thrive well on bread and biscuits, which can always be safely given in conjunction, or alternately, with fruits and vegetables; boiled rice should be strictly avoided. Some cassowaries have been observed to eat insects.

Breeding.—Cassowaries have never laid in this garden, but a few years ago they bred in the menagerie of the late Rajah Rajendra Mullick of Calcutta.

Transport.—The battened cages in which cassowaries are imported are unsafe: strong plank cages should be provided for a long journey.

TREATMENT IN SICKNESS.

*Inflammation of the lungs; bronchial catarrh; inflammation of the entire mucous lining of the mouth** and *diarrhœa* have been met with in the cassowaries exhibited here; treatment is seldom of any avail when the disease gets real hold of an animal; but to alleviate suffering remedies already recommended in similar cases may be tried.

OBSERVATIONS ON THE HABITS OF CASSOWARIES.

The female cassowaries are generally more pugnacious and ill-tempered than the males; nevertheless they all become remarkably tame within a short time. They are very lively animals, and often indulge themselves in kicking and jumping. When fighting they kick with great force and energy.

(400) THE EMU.

(DROMÆUS NOVÆ HOLLANDÆ—*Vieill.*)

Description.—"In form it closely resembles the ostrich, but is lower on the legs, shorter in the neck, and of a more thick-set and

* See under Emu, No. 400.

clumsy make. At a distance its feathers have more the appearance of hair than of plumage, their barbs being all loose and separate. As in the ostriches, they take their origin by pairs from the same shaft. The wings are so extremely small as to be quite invisible when applied to the surface of the body. They are clothed with feathers exactly similar to those of the back, which divide from the middle line and fall gracefully over on either side."—*Gould*.

Next to the ostrich it is the largest bird known, standing between 5 and 6 feet in height. The prevailing colour of the plumage of an adult bird is light brown or greyish-brown, mottled with greyish-black; the head and neck are covered sparingly with short feathers; bill black or dusky-black, depressed at the sides, straight and slightly keeled along the middle, and rounded at the extremity; nostrils large; irides yellowish-brown; legs dusky-black; toes, three, directed forward.

Hab.—Australia.

LENGTH OF LIFE IN CAPTIVITY.

Nine years. This, however, does not represent the maximum period, as the bird in question is still alive and well.

TREATMENT IN HEALTH.

Housing.—An emu is a very hardy creature and requires no housing, properly so-called; it must be assigned a large enclosure; a fencing similar to that recommended for the cassowaries does equally well; they are much given to fighting among themselves, rendering separation necessary; new arrivals introduced in enclosures already occupied by a pair or two generally fare badly: the vicissitudes of climate do not affect them, but experience has shown that when kept in low and damp places their health suffers. Crows are their great enemies, pecking them mercilessly whenever they can, and sometimes inflicting large wounds on their back.

Food.—In their wild state emus live upon grass and vegetables alone; in captivity they appear to be omnivorous, but their staple food consists of broken biscuits, bread, crushed food consisting of Indian-corn, oats, gram, with a quantity of vegetables; if the enclosure is large and green grass plentiful, they require little extra food; fruits are always welcome to them.

Breeding.—Emus have laid several times, but only once succeeded in hatching and rearing young ones. This happened in 1885-86: between the 4th of November and 23rd of December 13 eggs were laid, of which 2 were broken; on the 24th the male was found excited and anxious, visiting the eggs repeatedly, which were lying on a sandy patch of ground adjoining their shed; the place was at once fenced in with durmah mats, to afford as much privacy as possible. On the 26th the male sat on 11 eggs, to which 4 more were subsequently added. The period of incubation lasted for 63 days, the bird sitting all this time with praiseworthy perseverance, in spite of thunder-storms and heavy rains, to which it was twice exposed during the latter end of February. As it was never observed to leave its nest for food or drink,

fear was entertained about its life, so that, about the 39th day of its sitting an attempt was made to induce it to eat by placing tempting morsels close to the bird. This had the undesirable effect of disturbing the animal, which left the nest and began walking up and down in a most excited manner. Fortunately, however, it soon settled down again. It appears certain from the notes kept at the time that the bird was never observed to leave the nest during the prolonged period of incubation, except on the occasion mentioned above. It is presumed that it must have procured sustenance at night when there was nobody about, but a plateful of food left overnight was always found untouched in the morning. The emaciated condition in which the bird was found to be reduced rather supports the belief that it went without food. Of the 15 eggs, 4 were addled or broken and 11 hatched. The chicks at birth were striped longitudinally on the back and sides on a light greyish ground, the marking being black. For the first 12 hours or so the young emus require no food, but afterwards they should be fed on cabbages and doob grass chopped fine; for weakly birds hard-boiled eggs mixed with finely powdered meal should also be supplied. One of the chicks died when a week old; two were made away with at night by jackals. To insure against a similar mishap the nursery had to be enclosed with wire-netting. Of the eight surviving young, only two reached full growth, the rest dying before they were six months old, from the effects of *cold* or *gape*. The stripes of the young disappear in about six months, and they assume the mottled appearance of the adult.

Transport.—It is perhaps best to place them separately to prevent any chance of fighting.

TREATMENT IN SICKNESS.

The same as the cassowaries. One of the emus now living had, some three years ago, an attack of *inflammation* of the lining membrane of the mouth, to which *ulceration* supervened; while under treatment it was removed to another part of the garden. The effect of the change was marvellous; the animal soon recovered, and was sent back to the old place; before, however, six months had elapsed it again became subject to the same ailment, was again removed, and the result, as anticipated, was that it speedily recovered. Some of the cassowaries which died from the effect of the ulceration of the mouth and windpipe occupied the same enclosure where the emu was afterwards placed, and it is not unlikely that their lives might have been saved if timely removed like the emu. The grounds of the enclosure have since been somewhat raised and its drainage also improved.

OBSERVATIONS ON THE HABITS OF EMUS.

An emu is a very inquisitive creature, especially the young ones. Ordinarily emus walk with a heavy and measured step, but if so inclined they are capable of running with great swiftness, as may be seen when they are chasing one another or engaged in gambols; they leap, jump, and kick, roll over, then suddenly get up and begin the chase anew, stopping as suddenly again, each takes a different direction. This takes

place when they are in a pleasant mood ; but at other times one may be seen chasing another from quite a different cause. Lately two old specimens were introduced into an enclosure in which a pair of recent arrivals had already been placed ; everything went on satisfactorily for about an hour, but presently one of the older birds—a female—began chasing one of the new ; what provocation it had received was not known. It not only chased the poor thing, but kicked forward on its back with its powerful and massive limbs whenever it had an opportunity ; ferocity, pride, and a determination to vanquish were plainly visible in the large glaring eyes of the one, whereas the other looked extremely confused and frightened. An emu has been known to behave as if it were trained to perform ; on the approach of the keeper with the morning meal the bird would sit on its tail end, a few feet from him, and having balanced itself properly on its limbs, would, in a most deliberate manner, approach the man, inch by inch, swaying the head and neck from side to side in a most fascinating manner.

(401) THE OSTRICH.

(STRUTHIO CAMELUS—*Linn.*)

The ostrich is the largest of birds ; it has a small head, with a flat crown, a short, broad, and depressed bill, a long and muscular neck, a stout body, with wings incapable of flight ; extremely muscular thighs ; the feet have two toes, which are unequal in length and directed anteriorly ; the sole of the foot is furnished with a pad. Young ostriches have a mottled dark-brown plumage, with yellowish white quills and tail feathers ; these colours, in adult male birds, change into black and pure white, respectively, whereas the females become uniformly dark grey, or greyish brown ; the young birds have no down in the neck, the adult ones have. Two forms of ostriches are generally seen ; the visible portions of the skin of the neck and thigh are flesh-coloured in some, whilst in others they are bluish ; the former are said to be from Northern and the latter from Southern Africa.

Hab.—The ostrich is found throughout Africa, from Southern Algeria to the interior of the Cape Colony.

LENGTH OF LIFE IN CAPTIVITY.

Six years and a few months have been the longest period during which an ostrich has lived in this garden. The damp moist climate of Bengal does not suit the constitution of these birds.

TREATMENT IN HEALTH.

Housing.—A shed to protect the bird from draughts and cold during the winter nights, and an open-air promenade attached to it are the principal requisites ; during the wet weather it may be necessary to keep it in-doors continually for several days, and the habitation therefore need to be of sufficient length to allow the bird to walk up and down, as is its wont, during this forced confinement ; the floor of the shed should be somewhat higher than the level of the ground, and

perfectly dry; it may be built of brick-on-edge or of flagstone and joints well cemented; a thick layer of coarse sand should be spread over it, otherwise sitting on hard bare floor will hurt the bird; besides, it keeps the place dry. The sand should be frequently changed, especially during the wet weather; during the winter and summer the same sand may be used for several times after being exposed to the sun on each occasion; straw bedding should be avoided; the larger the ground for the promenade, the better. For practical purposes of exhibition, an enclosure 80 feet long and 50 feet broad, with a light iron fencing about 5 feet high, is enough for a pair of birds; the drainage of the ground should be perfect. A gravel path, some 4 feet broad, may be laid all round the fence inside, as the ostrich walks much alongside it; thick patches of sand here and there will also be much appreciated; the ground should be kept scrupulously clean of broken glass, broken bits of shells, old nails and such other things. Accommodation for an ostrich is not complete without a tank or pond where it can thoroughly enjoy bathing when it likes. It may be sometimes necessary to separate a pair, or there may be birds of unequal temper requiring separate lodgment. Such contingencies should always be anticipated in providing permanent habitation. Crows are a perpetual source of annoyance to ostriches. They peck the birds whenever they are out, causing wounds on the back, and sometimes rendering it necessary to keep them in-doors for days together until the sore heals. Unless shut out by wire-netting and other expedients, they do not hesitate to attack the ostriches in-doors. The matter is not so serious during the spring and summer, as the birds can be kept out at night, but during the winter it is so. The only effectual way of preventing this state of things is to cover the enclosure over and all round with wire-netting. This is expensive. Boys with bow and pellets to shoot the crows are sometimes employed, and for a time the annoyance ceases; but as soon as the boys become negligent, the crows begin to assert themselves again.

Food.—In their wild state ostriches are omnivorous, feeding on seeds, fruits, leaves, berries, beetles, locusts, frogs—in fact whatever comes in their way, taking in quantities of sand, stones, and other hard substances to help the digestion. In captivity their food consists of broken biscuits, Indian-corn, oats, and quantities of vegetables; a pound of beef or mutton meat each may be allowed once a week during the winter and rains. Some ostriches do not at all care for meat, others do. Although they may be always seen picking grass for themselves, fresh-cut grass should now and then be supplied; there should be a good supply of small stones and broken bricks in the enclosure for the purpose indicated above.

Breeding.—Ostriches have repeatedly laid in this garden, but never have they yet succeeded in hatching out any young.

Transport.—A narrow box-cage should be preferred to a broad one enabling the bird to turn round. In providing food for the journey, sand, grit, and small stones should not be forgotten.

TREATMENT IN SICKNESS.

Nothing positively is known about their ailments. There have been deaths of course, and consequently diseases also; but what they were

could never have been truly determined. Of the few cases that came under observation, the diagnosis was supposed to have been correct in one only; it was that of *acute rheumatism*: it happened just about the termination of the rains, and was no doubt brought about by damp, wet, and close confinement. The patient was hung on a sling, and anodynes, such as liniments of aconite and camphor, applied to the limbs; internally acetate of potash ($3\frac{1}{2}$ in a dose) was given twice daily, mixed with treacle and other eatables; but nothing availed: it lingered for about a month and died. A perfectly healthy male ostrich took ill one evening in April 1889, and was found dead the next morning. An autopsy was performed, and every organ was found to be as healthy as possible. There was a good deal of fat, but not to such an extent as to endanger life. There was, however, something wrong with the stomach; it was packed full of the food eaten the previous morning, including quantities of small stones and broken bricks. There was no digestion at all. The contents washed out, its surface was carefully examined; but nothing unusual could be detected. The case was pronounced to be a most unaccountable one by a competent authority who was present on the occasion, and to whom the bird was well known, and was attributed to distention of the stomach. Ostriches have suffered from *cold* brought on by exposure to draughts at night during the winter; the symptoms were—constant running from the nose, prostration, dullness, and want of appetite; temperature was high, and probably there was fever also; the bird was kept in-doors and provision made to secure its warmth at night; to support its strength it was fed on pounded meal mixed with boiled eggs, but as the patient showed great disinclination for food it had to be coaxed to eat. After a few days the animal was allowed to go out for an hour or two in the middle of the day: under this treatment it recovered in about a month. As a premonitory symptom of some fatal malady, ostriches have been noticed more than once to bend their neck in a peculiar way.

OBSERVATIONS ON THE HABITS OF OSTRICHES.

Like the emu, the ostrich is also inquisitive, but never as tame or familiar; there is a certain amount of wayward playfulness about it; the fleetness of an ostrich is remarkable, and some idea of it may be formed even in captivity; it is seldom at rest during the whole day, and executes most amusing antics and movements; it emits a deep booming sound, accompanied by much inflation of the neck. Whether from pure inquisitiveness or from a mischievous pleasure it finds in annoying a man, an ostrich sometimes behaves in a funny way, as the following instance, among others, will show. A sweeper woman was one morning engaged in cleaning the portion of the road just outside the enclosure of an ostrich. As soon as she came close to it, the bird trotted up and stood opposite her. She was naturally afraid to stoop and work in front of a formidable beak so menacingly near. She waited for half a minute, but the bird would not move; she raised her broom stick and shouted, the bird was still there. It would strut away for a second or two, but come back immediately again, and stand there, gently stamping its feet, swaying its neck, and flapping its wings, in evident satisfaction at the bewilderment of the woman.

(402) THE COMMON RHEA.

(RHEA AMERICANA—*Vieill.*)

The rhea is much smaller in size than an ostrich, which it closely resembles in form; its head and neck are completely covered with feathers; it has no tail, and possesses three instead of two toes; the wings are somewhat more developed than in an ostrich.

Hab.—South America, extending from Bolivia, Peraguay, and South Brazil to as far south as the Strait of Magelan.

LENGTH OF LIFE IN CAPTIVITY.

Of a pair obtained in November 1885, the female died in about six months: it never properly recovered. The male met with an accident, and had to be killed: it lived for about two years in the garden and was thriving.

TREATMENT IN HEALTH.

With regard to *housing* and *food*, it may be treated generally like an ostrich, which it much resembles in habits also.

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